



1977-1978

Rush-
Presbyterian-
St. Luke's
Medical
Center

Chicago

Rush University College of Health Sciences and Graduate School Bulletin

Rush University Calendar

1977-78	Fall Quarter	1978-79
September 21-23	Orientation and Registration for New Students	September 20-22
September 26	Classes and Twelve-Week Clerkships Begin	September 25
October 22	Eight-Week Clerkships End	October 21
October 24	Eight-Week Clerkships Begin	October 23
November 24-25	Thanksgiving Day Recess	November 23-24
December 5-9	Examination Week	December 4-8
December 17	Clerkships End	December 16
Winter Quarter		
January 3	All Classes/Clerkships Begin	January 2
February 25	Eight-Week Clerkships End	February 24
February 27	Eight-Week Clerkships Begin	February 26
March 13-17	Examination Week	March 12-16
March 25	Twelve-Week Clerkships End	March 24
Spring Quarter		
March 27	Classes/Twelve-Week Clerkships Begin	March 26
April 22	Eight-Week Clerkships End	April 21
April 24	Eight-Week Clerkships Begin	April 23
May 29	Memorial Day—No Classes	May 28
June 5-9	Examination Week	June 4-8
June 10	Saturday Commencement	June 9
June 17	Clerkships End	June 16
Summer Quarter		
June 19	Classes Begin	June 18
July 5	All Clerkships Begin	July 2
July 4	Independence Day-No Classes	July 4
August 23	Classes End	August 22
August 24-25	Examination Period	August 23-24
August 26	Eight-Week Clerkships End	August 25
August 28	Eight-Week Clerkships Begin	August 27
September 4	Labor Day-No Classes	September 3
September 23	Twelve-Week Clerkships End	September 22



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Rush University College of Health Sciences and Graduate School Bulletin

This bulletin is published for the faculty, students, and prospective students of the College of Health Sciences of Rush University. The University reserves the right to make changes in any or all specifications contained herein and to apply such revision to present and new students alike.

Rush University
The College of Health Sciences
600 South Paulina Street
Chicago, Illinois 60612
(312) 942-7100

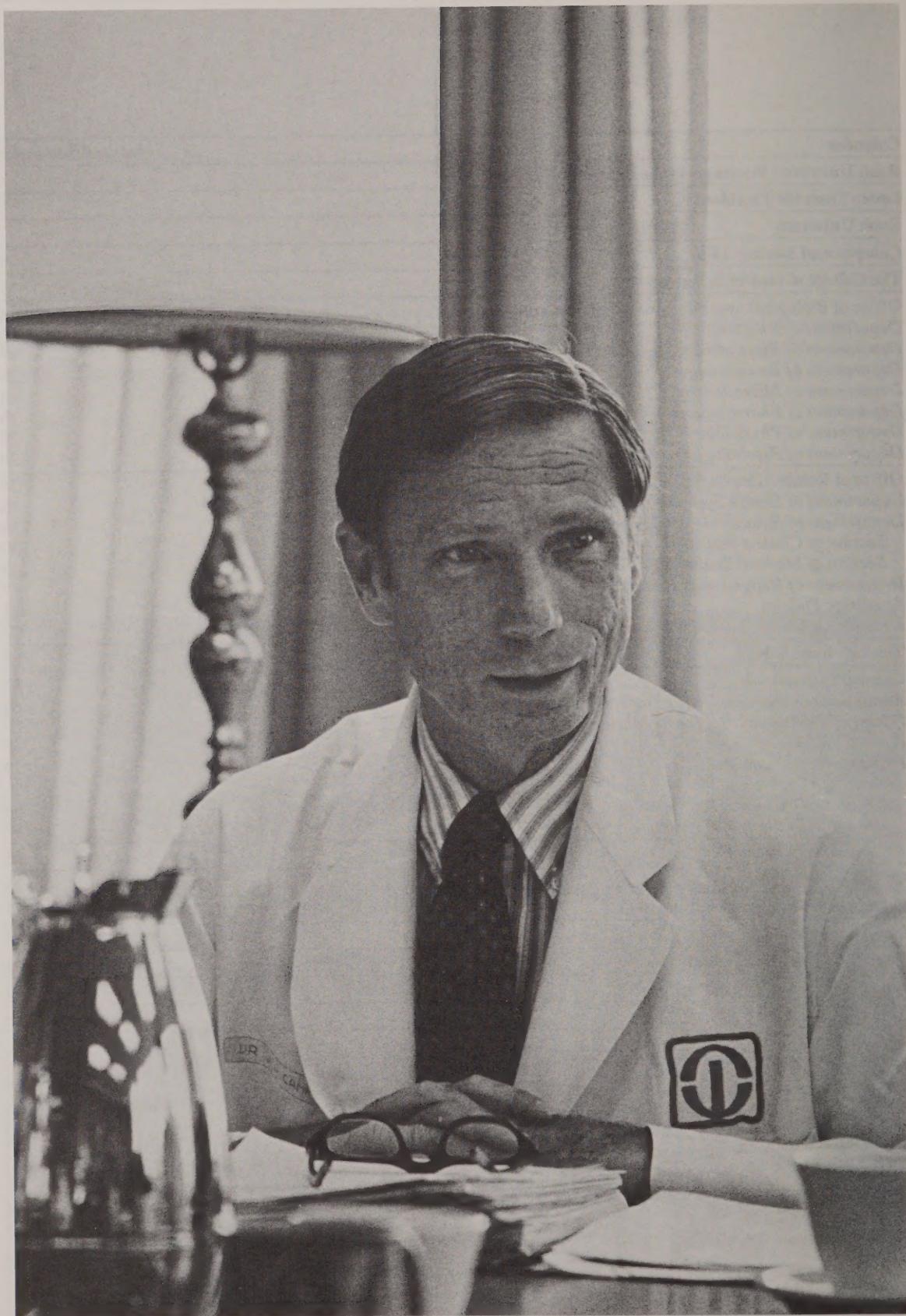
Rush University Programs in the Health Professions 1977-1978

College of Health Sciences	Bachelor of Science Medical Technology Master of Science Clinical Nutrition Health Systems Management Doctor of Philosophy Biochemistry Immunology Physiology
Rush Medical College	Doctor of Medicine
College of Nursing	Bachelor of Science Master of Science with majors in Community Nursing Geriatric/Gerontological Nursing Medical/Surgical Nursing Oncological Nursing Psychiatric Nursing Post Master's Study in: Geriatric Nursing Doctor of Nursing Science



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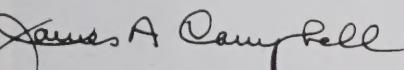


The concept of an academic health center has gained recognition throughout the United States as an important organizing principle for patient services, scientific inquiry, and health education. At Rush-Presbyterian-St. Luke's Medical Center, our approach in the development of such a center is based on a commitment to orderly and balanced growth among all the components — patient care, education, and research.

The College of Health Sciences and its Graduate School arise out of the strengths of these components. This college, with sister colleges of medicine and nursing, comprise Rush University. The university, therefore, exemplifies the concept that an organized system of patient care must also produce the individuals necessary to optimal provision of such care.

The College of Health Sciences, through its basic and applied science faculties, has a number of charges expressive of the overall goal of the medical center. It is largely responsible for developing and maintaining a level of excellence in furthering investigation of the increasingly complex problems related to the understanding of health and its impairments. It is responsible for the education of students in those professional scientific areas needed to support the most effective approaches to health care. It is also responsible for the doctoral education of students in those basic biological and behavioral research skills which are fundamental in gaining understanding of the human condition. In all of its programs, the College is appropriately committed to the belief that scientists and professionals, in areas of health care other than medicine and nursing, are also an integral part of the health care endeavor.

To those of you who will enter the college as students, I extend the welcome of our medical center and university and the invitation to share our objectives. Your responsibility is to grow. Our responsibility here is to nurture your growth in every way we can.



James A. Campbell, M.D.
President



The University

The establishment of Rush University in 1972 by the Trustees of Rush-Presbyterian-St. Luke's Medical Center represents a combined heritage that stretches back to 1837. On March 2 of that year, the Illinois State Legislature chartered Rush Medical College—two days before the city of Chicago was incorporated.

The Rush Medical College tradition began with Dr. Daniel Brainard, the founder, and Dr. Benjamin Rush, a signer of the Declaration of Independence and the physician for whom the College was named. Dr. Brainard was a distinguished surgeon and scientific investigator who led Rush Medical College to exert strong influence on medical practice and scientific research. Two years after the establishment of the Medical College, Dr. James Van Zandt Blaney, a member of the faculty, opened the first free medical dispensary west of the Allegheny Mountains. It became known as the Central Free Dispensary in 1873. In 1864, St. Luke's Hospital was founded, and, in 1883, Presbyterian Hospital. All three institutions merged in 1956 to form Presbyterian-St. Luke's Hospital and Health Center. In 1969, Rush Medical College merged with the Hospital to create Rush-Presbyterian-St. Luke's Medical Center.

In 1885, the first antecedent of the College of Nursing, the St. Luke's Hospital Training School of Nurses, opened its doors to offer diploma education in nursing. In 1903, the Presbyterian Hospital School of Nursing accepted its first students, and from 1956 until 1968 nurses were taught at the merged Presbyterian-St. Luke's Hospital School of Nursing. Before the establishment of the College of Nursing in 1973, a total of 7,221 nurses had graduated from these three schools. Many made outstanding contributions to the field of nursing.

The College of Health Sciences, established in 1975, is the newest academic component of Rush University. Its present elements include all pre-existing basic science departments of the Medical Center, organized within the Office of Biological and Behavioral Sciences and Services; a number of departments of related health sciences, organized within the Office of Related Health Sciences; and, finally, the Rush Graduate School.

The mission of the College is to exercise responsibility for the education and training of undergraduate students, graduate students, and postgraduate fellows, in those degree programs which the faculty generates, from the baccalaureate through the doctorate. The College is also responsible for the continuing development of research programs, the application of new knowledge to improve health care, and the teaching of basic sciences in other colleges of the University. In all of its educational programs, the College is particularly committed to the concept that scientists and professionals, in areas of health care other than medicine and nursing, are also an integral part of the health care endeavor. Their education, therefore, is seen as central to the growth of a more successful system of health care delivery.

Today Rush University continues to build upon its tradition of commitment to the education of future health care practitioners and to the establishment of a rational system for the delivery of care to all segments of the population. The University is fully accredited by the North Central Association of Colleges and Schools to offer programs leading to the baccalaureate, master's, and doctoral degrees. As an integral element of Rush-Presbyterian-St. Luke's Medical Center, Rush University is part of a cooperative health care delivery system which serves approximately 1.5 million people through its own resources and those of affiliated health care and academic institutions. At the Medical Center, more than \$6 million is budgeted each year to carry out basic research and clinical investigation in traditional disciplines and in multidisciplinary areas, as well as in nursing and related health.



Campus and Student Life

The Campus

The College of Health Sciences, Rush Medical College, and the College of Nursing are located on the campus of Rush University at Rush-Presbyterian-St. Luke's Medical Center on Chicago's near west side. The 20-building Medical Center complex includes: Presbyterian-St. Luke's Hospital; the Marshall Field IV building, an out-patient mental health facility; research buildings, where more than \$5 million is budgeted each year to carry out basic and clinical investigations; academic facilities for Rush Medical College, the College of Nursing and the College of Health Sciences; a professional office building; apartment buildings, the Laurance Armour Day School for children of employees and students and the Johnston R. Bowman Health Center for the Elderly. The Sheridan Road Pavilion on Chicago's North Side is operated as an integral part of the Medical Center.

In September, 1976, the new Academic Facility of Rush University was dedicated. The structure is the hub of activity of Rush University and accommodates large class activities, small group seminars, and individual instruction. The Dean's and admissions offices for all colleges are located in this building. It has direct internal access to the Professional Building and patient care and research facilities. Involvement of students with faculty and staff at these adjacent facilities is an integral element of the academic programs at Rush.

The new building includes a large multidisciplinary laboratory, surrounded by ten unit laboratories. Each unit houses 16 student stations for basic science studies. A separate gross anatomy laboratory is designed on the same modular concept. A central demonstration area and model room is accessible from four dissecting modules, each with six tables. Two 150-seat lecture halls are designed to utilize all types of media presentations and live demonstrations. The Center for Educational Resources supports all instructional activities for faculty and students, including the Library, Learning Resource Laboratory (equipped with 31 audio-visual study carrels), computer assisted instruction, Biomedical Communications, and Curriculum and Evaluation.

The Library of Rush University, which serves the entire University campus, is the oldest medical library in the City of Chicago and is located in the new Academic Facility. It is administered by a staff of professional medical librarians. The library has approximately 80,000 volumes, subscribes to 1,200 periodical titles, borrows documents from inter-library loan, and processes MEDLARS, MEDLINE and AV-LINE requests for patrons. New monographs and reference books are acquired at a rate of over 2,000 each year. The Library also has an outstanding collection of rare medical books that is available for research and study.

Schweppé-Sprague Hall houses new laboratories for basic and clinical sciences, lecture rooms, classrooms and student lounges. Student support offices and the bookstore for the University are on the first floor.

Clinical Experiences

Students of Rush University primarily receive their clinical training at Presbyterian-St. Luke's Hospital, a voluntary, not-for-profit hospital with a professional staff of 700 physicians and scientists, 1,000 nurses and 280 house staff receiving graduate medical education in over 30 specialty areas. Students also spend clinical time at other agencies and institutions in the Chicago area. Each year over 27,000 patients are admitted to the Hospital, using 864 beds and 39 bassinets. By tradition, each patient participates in the teaching programs of Rush University. The Hospital is directly across the street from Schweppé-Sprague Hall.

In clinical settings, health sciences students are required to wear white laboratory coats.

Affiliated Hospitals

Affiliated hospitals and a community health center in Illinois cooperate with Presbyterian-St. Luke's Hospital in providing students and house staff with opportunities to participate in the delivery of health care in a variety of socioeconomic settings in urban and rural areas.

Participating institutions are:

Bethany Brethren/Garfield Park Hospital, Chicago:	128 beds
Central DuPage Hospital, Winfield:	237 beds
Christ Hospital, Oak Lawn:	809 beds
Community Memorial General Hospital, LaGrange:	276 beds
Galesburg Cottage Hospital, Galesburg:	234 beds
Schwab Rehabilitation Hospital, Chicago:	67 beds
Mount Sinai Hospital Medical Center, Chicago:	440 beds
Swedish Covenant Hospital, Chicago:	235 beds
West Suburban Hospital, Oak Park:	372 beds
Mile Square Health Center, Chicago:	over 20,000 patients registered

Housing and Transportation

Rush University is primarily a commuter campus. An agreement between the University and Illinois Institute of Technology allows Rush students to apply to live in residence halls on that campus.

Students need to be aware that the Rush class schedule may necessitate missing certain meals at IIT. Students must make alternate plans in that event.

The residence halls for both male and female students provide central dining rooms, lounges, study rooms, laundry, and storage facilities. Apartments, ranging from efficiency to three bedrooms, are available for married students and graduate women students.

This arrangement provides students with an opportunity to participate in the cultural and social activities at IIT. Transportation for students commuting between the IIT campus and the Rush University campus is provided on a limited basis.

Rush students may also apply to live in Herman Crown Center, the residence hall of Roosevelt University. Herman Crown Center is located in downtown Chicago, within 20 minutes of Rush by public transit. It is a co-educational facility with fully furnished double rooms.

Off-campus housing of the student's choice is available in Chicago and the suburbs. Limited housing is available on the Rush campus; written requests should be directed to the Office of Student Affairs.

Students are encouraged to make all housing inquiries early to:

The Office of Student Affairs
Rush University
1743 West Harrison Street
Chicago, Illinois 60612
(312) 942-6302

Public transportation to and from the Rush campus is available. The "Congress A" train, from downtown Chicago and western suburbs such as Oak Park, stops two and one-half blocks northwest of the campus at the "Medical Center" stop. The "Douglas B" train, from downtown, stops at "Polk Street," at the southeast corner of the campus. Chicago Transit Authority buses also stop at the campus.

Students who commute by automobile may park in the Medical Center parking lots at the northeast and southeast corners of Ashland and Harrison or in the Medical Center garage at a modest daily fee. Free parking is available at Illinois Institute of Technology.

Health Services and Counseling

The University has authorized a two-part program of medical service to protect and promote the health of its students. First is ANCHOR, a health maintenance organization oriented toward illness prevention. ANCHOR provides a variety of professional services and ambulatory care which is described in more detail in a brochure which may be obtained from The Office of Financial Affairs. All students are automatically members of ANCHOR during any period they are enrolled in Rush University. Students are not automatically members of ANCHOR during periods when they are not enrolled and during the summer quarter. Students wishing to maintain their ANCHOR membership during the summer must notify the Office of Financial Affairs prior to the end of the spring quarter and must pay an additional ANCHOR fee. A student's spouse and dependents may be enrolled in the ANCHOR program at an additional fee.

Costs for 1976-77 participation were:

Anchor	Per Quarter	Summer Plan
Single	-0-	\$30.00
Couple	\$27.00	\$57.00
Family	\$75.00	\$105.00

Second is the Blue Cross Hospitalization Insurance. Each student must maintain this Blue Cross coverage or its equivalent from the date of matriculation until graduation, including summer quarters. Prior to matriculation, students must notify the Office of Financial Affairs of their intent to enroll in the University's Blue Cross Plan or indicate alternate coverage. A student's spouse and dependents may be enrolled in the Blue Cross Plan at an additional fee.

Costs for 1976-77 participation were:

Blue Cross	Per Quarter	Summer Plan
Single	\$ 39.00	\$ 39.00
Family	\$171.00	\$171.00

Students not enrolled in the University are ineligible for the University's Blue Cross coverage.

A professional counselor is available to assist students in educational and vocational planning, emotional and social adjustment, finance, marriage and family, reading and study, or in any other area in which greater self-understanding is sought.

In order to facilitate a free and open discussion of all issues, the University counseling service maintains strict standards of privacy and confidentiality. No information is released to anyone, inside or outside the University, without the informed consent of the student.

Social and Cultural Opportunities

With more than 780 students currently on the Rush University campus, there are a variety of co-curricular activities. The Office of Student Affairs works with students to plan organized programs.

The Steering Committee is an elected group of students whose purpose is to provide appropriate representation for all students in the College of Health Sciences and College of Nursing. The Steering Committee acts as a liaison with faculty, students, and administration for the mutual exchange of ideas, and insures that students will have representation in formulating policies and procedures related to the needs of students.

The University Programming Board is an elected group of students who work with the Office of Student Affairs to plan and implement co-curricular programs.

Chicago's Loop area, with its many opportunities in art, music, drama, films, and museums, is located approximately two miles from campus. It is easily reached by car or by public transportation. Outstanding attractions in Chicago include the Chicago Symphony Orchestra, Lyric Opera, Art Institute, Museum of Science and Industry, Field Museum of Natural History, Shedd Aquarium, and Adler Planetarium.

Lake Michigan provides an ideal site for a variety of activities such as swimming, boating, fishing, bicycling along the lake shore path, and sunning. During the winter months, ice skating and cross-country ski enthusiasts have access to Chicago's expansive parks.

Rush University expects to continue an arrangement for Rush students to use physical educational facilities at the University of Illinois Chicago Circle Campus. The fee structure and procedures for obtaining a pass will be announced fall quarter by the Office of Student Affairs.

Career Opportunities

Rush provides students with information concerning job opportunities. The Office of Student Affairs provides information on summer job opportunities particularly between the junior and senior year of the undergraduate program. The Office of Student Affairs coordinates a Career Fair to acquaint students with job opportunities available at health care agencies after completion of their program.

International Students

Rush University welcomes students from other countries. Every effort is made to help the foreign student adapt to life in the United States.

The Test of English as a Foreign Language (T.O.E.F.L.) must be submitted if English is not the applicant's native language. Any evidence in support of the application must have an authorized English translation.

Rush University may educate foreign students only by permission of the United States Justice Department, Immigration and Naturalization Service. Form I-20 will be issued at the request of the student when an offer of admission is made. Students may not work, so they must be able to finance their entire education.



The College of Health Sciences



The following pages describe the departments and divisions of the College and its Graduate School; their research, educational and service programs; and the policies and procedures governing student admission and progression.

Office of Biological and Behavioral Sciences and Services

Cecilia Brocken, Ph.D., Associate Dean

Departments

Anatomy	15
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Department of Anatomy

Anthony J. Schmidt, Ph.D., Chairperson

Faculty

Colgan, J.	Hovde, C.	Maibenco, H.	Seale, R.
Dinsmore, C.	Hughes, W.	Martinek, J.	Wagoner, N.
Durica, T.	Khedroo, L.	Schmidt, A.	

Research Activities

The fundamental search of the faculty in anatomy lies in elucidating the structure and function of cells, tissues and organs composing the fabric of life of all living creatures. Investigations are conducted in such diverse areas as, for example, DNA synthesis during gestation in the reproductive system, formation of retinotopic projections to the optic tectum in the chick visual system, corneal lesions and induced microcirculation, cell biology of normal and pathologic mammalian skeletal and cardiac muscle, repair mechanisms in the central nervous system (CNS), in urodele limb regeneration. Employed in these investigations are such experimental approaches as surgical manipulations, light and electron microscopy, histochemistry, radioisotope labeling for autoradiography, spectrophotometric assay, electrophoresis and isoelectrofocusing procedures. In addition to individual faculty laboratories the department has developed three special purpose facilities for research, one serving microsurgery, incubations and organ cultures, a second for bioassays, and a third for microtomy.

Interdisciplinary collaboration is encouraged, especially where clinical application may evolve from basic research. In particular, faculty members currently share in ongoing investigations into the biomechanics of human motion conducted within the Gait Laboratory of the Department of Orthopedic Surgery. Also, there is continuing study of the neurobiology of the visual system in cooperation with the Department of Ophthalmology. These, and other affiliations, bespeak the broad interest and research activities of the faculty.

Educational Activities

The primary purpose of the anatomical sciences in our medical curriculum is to assist the student to develop a working concept of the morphology of the human body. Anatomical programs are instructive in the gross and microscopic architecture of the human body relevant to the body's functions, and to its embryological origins. As a science, anatomy is fundamental to the health professions, and its understanding essential to the art of medicine.

To understand the structural details and complex relations of parts of the human body, the very basis of its activities, you must take it apart yourself. Therefore, a laboratory experience in the direct study of the human body is very important in anatomy (anatome = to cut up, Gr.). The student will devote much time in the laboratory dissecting a cadaver by region, gradually developing a personal conception and appreciation of the human body. To assist in this learning process, frequent reference is made to living anatomy and to clinical correlations. Lectures, preceptorials and audiovisual aids serve to enrich the student's education.

The histological and ultrastructural organization of the human body is studied to develop a sound understanding of the microscopic architecture and functions of cells, tissues, organs and systems. Though the inseparable relationship to the normal healthy structure and function of the body will be evident, microscope anatomy is essential to recognizing the clinical pathologies of disease. A laboratory experience with microscopic and prepared slides is an important part of the program, which includes coordinated introductory and conceptual lectures, and preceptorial discussions.

Neuroanatomy is taught as part of the neurosciences program where sound concepts of the gross and microscopic organization of the central nervous system is essential to understanding functional neurology.



Department of Biochemistry

Howard H. Sky-Peck, Ph.D., the John W. and Helen H. Watzek Chairperson

Faculty

Bays, J.	Dubin, A.	Kanamarlapudi, N.	Quarfoot, A.
Bezkorovainy, H.	Harris, L.	Kornel, L.	Rafelson, M.
Booyse, F.	Harrison, W.	Kuettner, K.	Sky-Peck, H.
Chang, M.	Hayashi, J.	Lobstein, O.	Swenson, J.
Cohen, M.	Hof, H.	Mattenheimer, H.	Tulloss, J.
Cole, E.	Hoskin, F.	Miller, R.	Weinstock, H.
Demidow, L.	Kachmar, J.	Morley, C.	Whisler, W.

Research Activities

The Department maintains and encourages varied programs of basic and multidisciplinary research. Approximately 8,000 square feet of general laboratory space including two coldrooms, complete photographic darkroom, and two instrument rooms are dedicated to these research activities. The major research items of equipment include: Biogard and Sterilegard hoods for tissue culture, Nikon inverted tissue microscopes, CO₂ incubators, Beckman Amino Acid Analyzers, Analytical Ultracentrifuge, Preparative ultracentrifuges, liquid scintillation and gamma spectrophotometers, various spectrophotometers and electrophoresis apparatus.

Research programs presently being conducted by members of the department include:

A program to study certain biochemical manifestations of von Willebrand disease through the expedient of cultured aortic endothelial cells from normal and genetically altered pigs. The growth characteristics of the two types of cells are being monitored by radioactive labeling of macromolecules and by electron microscopy. Differences between normal and abnormal cells are studied by observing responses to biologically active reagents such as enzymes, hormones, and intermediary metabolites. Among the effects being studied are cellular attachments to substratum, presence of factor VIII, rate of synthesis of ristocetin-Willebrand factor (RWF), and its location in the cell cultures. Specific assays include ristocetin induced platelet aggregation, immuno-electrophoresis, radioimmunoassay, immunofluorescence, and immunoelectron microscopy. The interaction of platelets with endothelium are being studied *in vitro*, using normal and diseased platelets and endothelium. This interaction is effected by enzymes, hormones, antibodies, metabolites, mechanical effects and certain purified plasma proteins. Finally, the characteristics of the RWF produced in culture under various growth conditions are being compared to the plasma factor purified from normal pig plasma.

An established line of cultured bovine aortic endothelial cells has also been used as a synthetic vessel wall model for studying certain aspects of *in vitro* platelet-endothelium (vessel wall) interactions. ¹²⁵I-labeled platelets (single or aggregates) do not interact with normal unactivated or undamaged monolayers of cultured endothelial cells. However, extensive interaction is observed after treatment of the monolayers with epinephrine, serotonin, trypsin, heat, and scraping. ¹²⁵I-labeled platelet-endothelial interaction was decreased by preincubation of the ¹²⁵I-labeled platelets with PGE, ATP, and aspirin. Optimum platelet-endothelial interaction was obtained at 120 rotations per minute for 4 minutes. Increasing numbers of platelets as well as increasing numbers of red cells increased platelet-endothelial interaction. Electron microscopy of endothelial cultures, activated and interacted with platelets, showed the association of single platelets and platelet aggregates with an extensive matrix of 100 to 200 Å extracellular microfilaments (longitudinal sections) between and/or beneath the activated, cultured endothelial cell monolayer. The isolation and characterization of these microfilaments is in progress as a means of obtaining a better understanding of the role of these structures in platelet-vessel wall interactions and the subsequent information of mural thrombi.

Monkeys have been immunized with dextrorucrase, levensucrase, or neuraminidase obtained from *Streptococcus sanguis* and *Streptococcus mutans*. Approximately 50 percent of those animals immunized were protected against dental caries as compared with control animals not immunized with enzymes.

Inhibition of the neuraminidase activity by sera of immunized monkeys increased with immunization up to 90 to 100 percent inhibition, as compared to an average of 35 percent inhibition in the controls. Absorption of the monkey immune sera by human anti IgA, anti IgG and anti IgM removed the neuraminidase inhibiting activity only in the sera absorbed by the anti IgM.

These present data suggest that primates may be immunized against their own bacteria by using enzymes of these oral microorganisms to protect against dental caries. This protection is accompanied by production of

enzyme-inhibiting substances in the serum. These inhibitions in the immune sera are removed by human anti IgM. Significantly, this fact points to the feasibility of a vaccine which will protect against most oral microorganisms and possibly protect against dental caries.

Of great importance to the understanding of the mechanisms involved in cartilage metabolism and calcification is the elucidation of the nature of the extracellular environment in which these processes occur. Such a consideration involves the biochemical, physical, chemical and physiological-morphological environment of the chondrocytes which are themselves involved in the alterations of their own surroundings. Present concepts in molecular biology and histochemistry have put forward the hypotheses that cells not only "produce" and "govern" their extracellular matrix or "milieu" but that there is also a feedback from the extracellular matrix to influence and regulate the physiological activity of the cell. Since in cartilage, the cells are embedded in a specific "matrix within a matrix" (the lacunar or territorial matrix), the chemical composition and the physiological state of this cellular environment have to be identified and understood before the proposed regulatory mechanisms of matrix-cell and cell-matrix interactions can be understood.

The present project limits itself to studies of the ground substance of the epiphyseal cartilage. The model for these studies has been in the past and will continue to be the epiphyseal growth plate of mammals. In the epiphyseal plate there seems to be adequate evidence that the aggregated proteoglycans play a role in the calcification process via specific control mechanisms determined by the local physiology of the cells of calcifying cartilage. This regulation may well involve the polyelectrolytes concentrated within the lacunar area of the cell. Calcification, however, is never seen within the lacunar area but occurs in an adjacent locus in the matrix of the hypertrophic and calcified zones. We speculate that specific anionic proteoglycans together with their associated glycoproteins and collagen are capable of regulating the different phases of calcification. We speculate further that the ratio of territorial (unextractable) and extra-territorial (extractable) proteoglycans and hyaluronic acid is regulated by the cell and that this ratio is extremely important for the processes of calcification.

Human milk proteins have been under investigation in this laboratory for the past few years and represent an extension of previous work on bovine milk and colostrum proteins. Attention is being focused on those human milk proteins that tend to stimulate the growth of *Lactobacillus bifidus*. A number of such proteins from human colostrum and milk have been isolated. As shown previously, these glycoproteins were rather small in size, but contained enormous amounts of carbohydrate, including galactose, glucosamine, galactosamine, sialic acid, and fucose. The carbohydrate was partially removable with alkaline borohydride, indicating the presence of O-glycoside linkages, as well as possible heterogeneity of the oligosaccharide chains. These glycoproteins had no blood group activity and did not mediate cellular immunity. The human proteose-peptone fraction was not analogous to that obtained from bovine milk. The main components of the human milk proteose-peptone fraction proved to be alpha-lactalbumin, the small glycoprotein promoting the growth of *L. bifidus* previously isolated from human milk by a different method, a large molecular-weight glycoprotein of as yet unknown nature, and a temperature-sensitive protein, which precipitated at room temperature and dissolved upon cooling. Since it contained phosphate and its amino acid content was similar to that of beta-casein, we surmise that it may be one form of human beta-casein.

It has been reported recently that hydrocortisone is able to stimulate adult rat hepatocytes in culture to undergo proliferation. Using a hepatocyte culture system, we have been able to show a significant increase in the DNA synthesis (Measured by ³H-thymidine incorporation) of the cells when exposed to hydrocortisone, especially in the presence of dibutyryl-c-AMP, GTP, insulin and glucagon. It has been observed that monolayer formation with these cells is best in the presence of insulin and shown that these are significant nucleotides. Increasing Ca⁺⁺ from 1.5 to 9 mM had no effect on the cells' capacity to synthesize DNA, in contrast to other cells, and, also, addition of vitamin B₁₂ had no effect on cells.

At present, an investigation is in progress into the optimum level of hydrocortisone for stimulation of the cells and the effect on cells stimulated but uncommitted to DNA synthesis *in vivo* and how they may be "pushed" into DNA synthesis in culture.

A protein containing hydroxyproline has been identified absorbed to the cellular elements of whole human blood. Initial isolation procedures and immunologic studies indicate that this is not Clq (part of the first component of the complement system). This protein which may be some form of collagen is being isolated and characterized via classical biochemical methods. A specific antibody is being induced in rabbits and immunofluorescent studies performed on sections of small arteries from both surgical and autopsy materials.

Other research programs of the Department of Biochemistry include the physical and chemical properties of human alpha-amylase from saliva and pancreas and its isoenzymes; cell kinetics and the metabolic control by DNA in cancer; the kinetics of creatine phosphokinase obtained from various human tissues; the effects of

nicotine and tobacco smoke on platelet-endothelial cell interaction; and the characterization of a collagen-like protein found in platelets and red cells.

Educational Activities

Members of the Biochemistry Department participate in basic science and medical education programs within the department and interdisciplinarily. This participation is at many levels of education including undergraduate, pre- and post-doctoral programs. The department participates in the teaching of basic and applied medical biochemistry to medical students of Rush Medical College during the three phases of the curriculum; the training of medical technologists in clinical chemistry in the Medical Technology program of the College of Health Sciences; and the education of graduate students leading to a doctor of philosophy degree in the graduate school. The department also utilizes the facilities of the clinical biochemistry laboratory and research laboratories in the training of medical, basic science, and post-graduate students. Since the clinical laboratory is one of the most active up-to-date laboratories in the country, it provides opportunity for the teaching of medicine and for the training of clinical chemists. In addition, the department participates in seminars, rounds and multidisciplinary training programs.

Service Activities

The Clinical Biochemistry Laboratory is a modern, automated, computerized, high-volume medical service facility performing approximately 1,700,000 individual chemical tests per year. These include some 250 different biochemical tests from the more simple electrolytes, carbohydrates, and fats to the more complex proteins, metabolites and drugs. The objective of the clinical laboratory is to provide the most efficient, accurate and extensive patient service obtainable. To accomplish this, the laboratory is continually studying the expansion and development of its automated and computerized facilities, quality control programs, methodology and on-the-job training of personnel. Finally, it is the objective of the members of the clinical biochemistry laboratory that the facilities be used not just for patient services, but also as a teaching tool for medical student, house staff and graduate training and for a better understanding of human biology at the clinical level.





Department of Immunology

Henry Gewurz, M.D., the Thomas J. Coogan, Sr., M.D., Chairperson

Faculty

Claus, D.	Golden, H.	Luskin, A.	Siegel, J.
DiCamelli, R.	Hansen, B.	Merkel, F.	Suyehira, L.
Fiedel, B.	James, K.	Osmand, A.	Yamamoto, K.
Gewurz, A.	Jones, J.	Potempa, L.	Zeitz, H.
Gewurz, H.	Lint, T.	Sassetti, R.	

Research Activities

The primary investigative interests of this department include: the immunobiology of the inflammatory response; immune reactions of cells and membrane; the clinical, developmental and experimental biology of the effectors of the immune response, particularly the complement system; cellular immunology, particularly cell-mediated mechanisms in inflammation; the immunopathology of coagulation; the chemistry, biology and clinical relevance of C-reactive protein and the acute phase response, and their interrelationships with the immune systems in health and disease. The application of basic research to questions of human health in disease is a major area of emphasis. This involves the innovation and implementation of new approaches which utilize analysis of the immune status and immunoassays to aid in the rapid diagnosis and treatment of disease, and analysis of individual patients and groups of patients with unique primary or secondary abnormalities or aberrations of their immune systems. The department is well equipped with both teaching and laboratory facilities for research in experimental and clinical immunology.

Educational Activities

The department offers courses in basic and clinical immunology to medical, graduate, and related health science students, and postgraduate courses in clinical immunology to house staff and faculty. Weekly research seminars, clinical conferences, journal clubs and ward rounds are held. Eight graduate students currently are preparing for the Ph.D. degree. A student research program has involved upwards of ten medical and undergraduate students during the summer, and upwards of six individuals during the year. The department generally has three to four postdoctoral fellows training in basic and clinical immunology, and a training program in Allergy and Immunology is under development.

Service Activities

The clinical immunology laboratory provides patient services which include assays to measure the competence of the immune system, the presence and nature of given immune-mediated diseases, disease processes and host responses, and the use of immunologic methods to quantify host proteins as well as certain medications. Consultative services in Allergy and Immunology are provided.



Department of Microbiology

Lauren G. Wolfe, D.V.M., Ph.D., Acting Chairperson
William Landau, Ph.D.,
Director, Section of Bacteriology

Faculty

Baram, P.	Goldin, M.	McQuay, R.	Welsh, T.
Bergholz, C.	Goodheart, C.	Northrop, R.	Widra, A.
Casto, B.	Hatch, G.	Ogden, J.	Wolfe, L.
Deinhardt, F.	Jones, I.	Patterson, R.	
Falk, L.	Landau, W.	Peterson, D.	
Fisher, L.	Levin, S.	Schuytema, E.	
Gavitt, F.	Marczynska, B.	Shaffer, J.	

Research Activities

The research program includes studies of viral and chemical carcinogenesis, viral hepatitis, slow (virus) infections, relationship of rubella virus infection to rheumatoid arthritis, and methodology in diagnostic microbiology.

Carcinogenesis: Oncogenic RNA viruses (oncornaviruses) and lymphotropic herpesviruses of primate origin are evaluated for transforming potential *in vitro* and oncogenicity *in vivo*. Cell susceptibility, mechanisms of transformation and viral gene expression are investigated *in vitro*. Attempts to isolate or identify oncogenic viruses from spontaneous human and nonhuman primate tumors are pursued. Eight experimental tumor models (three sarcoma, one glioma, four lymphoproliferation) have been established in marmoset monkeys, and selected models are investigated from the standpoints of pathogenesis, viral gene expression, host immune response and efficacy of therapy or prevention. Studies of chemical carcinogenesis and viral-chemical co-carcinogenesis in primate cells are under way.

Viral hepatitis: Experimentally induced hepatitis A and non A-non B hepatitis are studied in marmosets. With non A-non B hepatitis attempts are under way to identify the etiologic agent(s) and to identify specific antigenic and serologic markers of infection. Cell cultures are examined for susceptibility to hepatitis viruses.

Slow (virus) infections: Kuru and Creutzfeldt-Jakob disease were transmitted to marmosets, and studies of etiology, pathogenesis and host immune response continue. A study of measles virus and its relationship to slow virus diseases is planned.

Persistent rubella virus infections: In collaboration with the departments of Medicine and Surgery, studies are under way to test the hypothesis that persistent, latent infection with rubella virus plays a role in the etiology of some forms of rheumatoid arthritis. In preliminary studies, antibodies to rubella virus were significantly elevated in a small sample of rheumatoid patients, and a cell membrane antigen that may be specified by the rubella virus genome was detected on rheumatoid synovial cells by cytotoxicity tests with monospecific rubella virus antiserum.

Clinical microbiology: Developmental research in clinical microbiology is aimed at development and/or refinement of diagnostic methods for use in the diagnostic bacteriology and virology laboratories.

The research laboratories are fully equipped for biological and biochemical research. Through the courtesy of the City of Chicago and the Chicago Board of Health, space is provided at the Municipal Communicable Disease Hospital for maintenance of a marmoset colony (approximately 1,000 animals) and for laboratory support.

Educational Activities

Diagnostic procedures and clinical background in bacteriology, virology, mycology, and parasitology are presented to medical technology students.

Classification, characteristics, laboratory identification and pathogenicity of infectious agents are presented to medical and graduate students. The opportunity to experience laboratory work in diagnostic bacteriology, diagnostic virology and virus serology is provided.

Biologic, immunologic and molecular properties of oncogenic viruses and selected infectious, immunological, degenerative, metabolic and neoplastic diseases of animals as models of human disease are studied in courses offered to graduate students.

A three-month rotation through the diagnostic bacteriology and virology laboratories is available as part of the residencies in Internal Medicine, Surgery and Pathology.

Service Activities

Bacteriological diagnosis, identification of fungi and parasites, virus isolation, and serology are performed in the diagnostic microbiology laboratories in support of patient care.



Department of Pharmacology

Paul E. Carson, M.D., Chairperson

Donald S. Ebersman, Ph.D., Director, Section of Pharmaceutical Sciences

Henri Frischer, M.D., Ph.D., Director, Section of Blood Genetics and Pharmacogenetics

Faculty

Bachand, R.
Carson, P.
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Gdalman, L.
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MacLeod, C.
Moon, B.
Nausieda, P.

Nootens, R.
Parkhurst, G.
Prancan, A.
Powers, R.
Rieckmann, K.

Trenholme, G.
Weiner, W.

Research Activities

Research is being conducted on the pharmacokinetics of drugs, especially as related to individual variation in drug response determined genetically, acquired or by interaction with other drugs or their metabolites. This work requires continued development of methods for measuring drugs in the blood, urine and other body fluids or tissues. This approach also will require ascertaining the pharmacology profile of individuals in terms of the activities of those reactions known to change drug metabolism such as fast and slow acetylation, variation in detoxifying enzymes or variations in enzymes such as G6PD deficiency which alter the response to drugs. In this context investigation of cellular metabolism especially of red cells as affected by drugs and the metabolites of drugs is being conducted not only in terms of the enzymic pathways of the cells but also in terms of membrane effects on the cytoplasmic enzymes.

Research being conducted by the Section of Blood Genetics and Pharmacogenetics includes the investigation of hereditary blood disorders with particular emphasis on the detection, physiopathology, host-drug interactions and treatment of those with red cell enzymopathies or hemoglobinopathies.

In the field of neuropharmacology, research is being conducted on the pharmacology and biochemistry of animal models of human movement disorders coupled with investigations into the mechanism of action of drugs used in the therapy of neurologic and psychiatric disorders.

Other areas under active investigation include the clinical pharmacology of the aminoglycosides, the role of prostaglandins in endotoxin shock and in platelet aggregation and the relationship of "tranquilizing" agents used in anesthesia to the analgesia induced by opiate derivatives.

Educational Activities

At present the Department of Pharmacology is responsible for teaching the sequence in medical pharmacology to students in Rush Medical College and basic pharmacology to the students in the College of Nursing. The course in medical genetics for the Rush Medical College is provided by the Section of Blood Genetics and Pharmacogenetics. The faculty also participates in the undergraduate teaching of pharmacology in the interdisciplinary courses offered in the second year of the medical school curriculum including the cardiovascular, respiratory, neurological and hematology task forces. The faculty provides elective experience in clinical pharmacology for the third and fourth year medical students. A graduate program leading to the Ph.D. Degree in Pharmacology in the Graduate School of the College of Health Sciences is also under active development.

Service Activities

Laboratory service includes determinations and the development of determinations of blood, urine and tissue levels of drugs being prescribed to the patient population of the Medical Center. Laboratory services are also provided to improve detection and management of inherited blood disorders and drug-induced disturbances. The Section of Pharmaceutical Sciences includes the Medical Center pharmacy system, i.e., the Hospital pharmacy, satellite pharmacies, and the pharmacies of the Sheridan Pavilion and the Johnston R. Bowman Health Center for the Elderly. Clinical pharmacology and pharmacy programs are currently being developed in conjunction with the laboratory to provide consultation for better patient care and to further improve patient care through the development of additional programs for drug surveillance, drug reactions and continuing education for medical students, house staff, nurses, pharmacists and attending staff.

Department of Physiology

Robert S. Eisenberg, Ph.D., the Francis N. and Catherine O. Bard Chairperson

Faculty

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Bullock, J.	Gottlieb, G.	Mathias, R.	Schauf, C.
Eisenberg, B.	Hegvany, C.	Michael, J.	Starr, M.
Eisenberg, R.	Kootsey, J.	Milner-Brown, S.	

Research Activities

Members of the Department of Physiology carry out research in three overlapping areas: (1) transport and electrical properties of excitable membranes; (2) motor and sensory processing in the mammalian nervous system, and (3) circulatory phenomena.

Membrane properties: Both the transport and the excitability properties of membranes are under study.

The properties of the digitalis-receptor of the heart, a component of the $\text{Na}^+ + \text{K}^+$ pump of the cardiac muscle membrane, are being studied. One project is focused on the physiological regulation of this system by hormones. Specifically, changes in cardiac performance that accompany altered thyroid function have been shown to result from altered synthesis of $(\text{Na}^+ + \text{K}^+)$ ATPase in the cardiac muscle membrane. In a related study the autonomic nervous system was shown to regulate $(\text{Na}^+ + \text{K}^+)$ ATPase via modulation of cyclic nucleotides. Finally, a technique for the automatic, continuous assay of $(\text{Na}^+ + \text{K}^+)$ ATPase is being developed.

The basic ionic mechanism underlying the action potential is being studied in voltage-clamped giant axons. Previous investigations have shown that when examined in sufficient detail, the kinetics of sodium activation and inactivation show striking departures from the behavior expected for a system consisting of non-interacting, voltage-sensitive gates such as those implicit in the classical Hodgkin-Huxley formulation. Presently, both traditional voltage-clamp and internal perfusion techniques, and new procedures for noise analysis and measurements of intramembrane charge movements are being used to further elucidate the molecular details of the sodium and potassium channels.

Skeletal muscle fibers have a structure considerably more complex than nerve axons, including invaginations of the surface membrane which form a tubular system running almost transversely across the fiber. The structural and electrical properties of skeletal muscle fibers are being studied in some detail, and a detailed model of the electrical properties expected from the branching tubular system is being constructed by measuring such properties using methods of linear electrical circuit theory. Techniques include both sinusoidal and stochastic analysis. The theory and measurements are being extended to try to predict the shape and conduction velocity of the propagating action potential, the natural electrical signal which initiates contraction. Attention also is being paid to the mechanism by which the action potential occurring across the membranes of the tubular system initiates contraction.

Information processing in the central nervous system: The processing of visual information by the mammalian nervous system is being studied in both human and experimental human preparations. The laterality of information processing in female subjects with Turner's syndrome is being investigated through the recording of visual evoked responses in the electroencephalogram. In animal models visual processing is being studied with microelectrode techniques (extracellular action potentials and evoked population responses); of particular interest here is the effect on the visual system of such homeostatic imbalances as hyperthermia and hypoxic hypoxia.

The control of motor behavior by the nervous system is also being studied in normal human subjects. Responses to different kinds of stimulus-induced errors introduced into the performance of various motor actions are being monitored. The latencies of these responses will provide information as to the CNS level at which they are generated and their amplitudes will provide a measure of the general level of excitability at different segmental levels. By studying different types of motor actions and using different stimuli, singly and in combinations, it will be possible to uncover information about the motor mechanisms responsible for the coordination of voluntary and involuntary (reflex) behavior.

Circulatory phenomena: Three separate projects are under way in this area. The effects of pulsation on blood flow in the laminar transition region are being studied. The pulse has been found to cause an early transition to turbulent flow, an effect which is strongly dependent on pulse amplitude but only slightly affected by pulse frequency. Furthermore, the effect is inversely related to tube length, being unimportant in tubes having the same geometry as actual blood vessels. These results indicate the importance of vessel geometry in protecting the cir-

culation against excessive energy losses from turbulence. A second project in this area involves a study of the microcirculation of skeletal muscle. Of particular interest here is the distribution of flow and the transport of materials that occurs during exercise.

Finally, the responses of the cerebral vasculature to conditions of hypoxic hypoxia are being investigated. Local blood flow, tissue oxygen levels, and neural function (visual evoked responses) are being monitored in an attempt to determine the mechanism(s) responsible for the high sensitivity of the cerebral cortex to oxygen lack. Also of interest are the occurrence and mechanism of oscillations in tissue oxygen tension recorded in some parts of the brain.

Educational Activities

The Department of Physiology is responsible for providing instruction in its disciplinary area to all University students requiring such instruction in fulfillment of their degree requirements. In Medical Physiology, for example, instruction is provided for approximately 150 medical and graduate nursing students, as well as a comparable number of undergraduate nursing students. In addition, in conjunction with the Division of Graduate Physiology, a variety of courses dealing with the electrical properties of cells and tissues, nuerophysiology, active transport, cardiovascular physiology, and applied mathematics is offered to graduate students.





Department of Psychology and Social Sciences

Cecilia Brocken, Ph.D., Acting Chairperson

Frank Leavitt, Ph.D., Director, Section of Psychology

Michael A. Counte, Ph.D., Acting Director, Section of Social Sciences

Faculty

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Braitman, L.	Feldman, H.	Lipoff, D.	Schneider, A.
Brocken, C.	Funk, J.	Lipgar, R.	Schoenenberger, J.
Cheifetz, D.	Garron, D.	McNamara, B.	Stephens, A.
Christman, L.	Guise, G.	Martin, D.	Ulrich, L.
Clark, D.	Hartings, M.	Miller, R.	Watson, L.
Counte, M.	Hegyvary, S.	Moncrieff, E.	Wilson, R.
Davis, L.	Kaszniak, A.	Padonu, G.	
Dawkins, M.	Leavitt, F.	Pavlou, M.	

Research Activities

The Department of Psychology and Social Sciences is increasingly involved in basic research with eventual relevance to health care concerns and also in research more immediately applicable to the development and evaluation of clinical practice. These various studies are being carried out independently and in collaboration with other departments and clinical services.

There is a program of studies generally concerned with neuropsychology of aging. Central to this program is a systematic study concerning the effects on cognitive function of both normal and pathological aging (presenile dementia). This study has shown that attention is relatively unimpaired during the normal aging process, although learning ability and recent memory become less efficient; in pathological aging, as indicated by cerebral atrophy, both attention and memory are impaired. An immediate practical result of this study is the validation of a cognitive and mental status examination for use in the diagnosis of generalized dementia and focal intellectual deficits. Related studies in this program include pre- and post-operative cognitive and intellectual evaluations of persons undergoing carotid endarterectomy; the relationships between cognitive deficits, liver disease, and cerebral atrophy in alcoholism; and the relationship of dementia to both electroencephalographic abnormalities and cerebral atrophy.

Another group of studies is concerned with the investigation and validation of behavioral approaches to the management and treatment of common clinical problems such as headache and other pain and neuromuscular symptoms, hypertension, and spastic dysphonia. Of most promise is the investigation of the initial success in the use of biofeedback techniques in enhancing motor recovery following stroke.

Studies of neck and back pain, carried out for the purpose of developing and evaluating diagnostic measures of pain, show that the subjective complaints of patients with demonstrable pathophysiology differ systematically from the subjective complaints of patients without demonstrable pathophysiology. These results have been obtained with attributes of subjective descriptions of pain which have not previously been of significance in the clinical, decision-making process; a new study to replicate and thereby definitively validate these findings is underway.

Systematic behavior genetic studies of persons with Turner's syndrome involve the largest and most representative research cohort with this condition to be followed. The studies are concerned with the relation of both intellectual and personality traits to the abnormality in the sex chromosome complement; other aspects of the research have suggested that the condition is the result of random loss among parental gametes and is unrelated to maternal age, paternal age, and proband birth order. Studies currently under way are concerned with the identification of the perceptual handicap associated with the condition, and on psychosexual development.

Attitudinal studies of health behavior correlates continue, directed at the problem of identifying beliefs which affect the use of health care services. Data from a 30-month study are being analyzed to elucidate relations between health attitudes and health behavior. A new study has begun, in conjunction with the Multiple Sclerosis Center, concerned with the behavioral adaptations of persons with multiple sclerosis, and their attitudes toward medical care.

There is a program of studies concerned with the behavioral correlates of cardiovascular disease. The current study investigates relationships between personality factors and both concurrent risk and subsequent morbidity and mortality from coronary heart disease.

One group of studies concerns children's difficulties, the family context in which these difficulties appear, and ways of managing these difficulties. There is also a collaborative study on attachment and feeding procedures, and another concerned with the effect on neonates' subsequent development of maternal, prenatal lead exposure.

Finally, there are various studies of factors affecting health and health care being carried out in the department. These studies are concerned with the development of methods to monitor and evaluate nursing care, and with the social epidemiology of diabetes, and on the effects of physician appearance on patient attitude.

The Department has its own research laboratories equipped with three-channel tachistoscope, eye-movement camera, flicker fusion apparatus, psychomotor apparatus, high-speed computer facilities, and variety of biofeedback equipment, including a Cyborg Biolab unit with EMG, EEG, and temperature feedback, a Bio-Dyne blood pressure feedback unit with "tonometric transducer," and Cyborg 2 channel strip-chart recorder.

Educational Activities

The Department has major responsibility for a curriculum of instruction in behavioral science for undergraduate medical education. The curriculum includes fundamental concepts and vocabulary, basic interviewing and relationship skills, human development and behavioral pathology, and a series of special topic seminar courses in areas of interface between behavioral science and medical specialties. The curriculum is intended to prepare the student physician for the psychological, social, and behavioral aspects of patient care.

The Department offers a one-year internship in clinical psychology, approved by the American Psychological Association, in fulfillment of the internship requirement of university doctoral programs in clinical psychology. Five elective options are offered permitting specialization in general clinical psychology, neuropsychology, child psychology, health care psychology, and community psychology. Intensive, supervised training is provided in the skills and functions which clinical psychologists are called upon to perform in most settings. Third and fourth year doctoral students are eligible for appointment. Training includes diagnostic assessment of the adaptations of adults and children and of events which have impact on adaptation. Emphasis is placed upon understanding the psychological and behavioral accompaniments of medical illness. Training encompasses psychotherapeutic and behavioral intervention, patient management, and skills.

A post-doctoral research fellowship is offered in clinical human neuropsychology. Open to individuals with a doctoral degree in psychology, this program provides advanced training in neuropsychological assessment and consultation, and an opportunity to develop an area of research on topics such as brain function, epilepsy, aging, dementia, language disturbance, behavior genetics, biofeedback, stroke rehabilitation, pain, alcoholism, basal ganglia disease and others.

Service Activities

Within the Section of Psychology seven programs of patient care can be described. These are the Diagnostic and Therapeutic Service, the Neuropsychology Service, the Office of Behavioral Studies, the Pediatric Psychology Program, the Children's Therapeutic Day School, the Multiple Sclerosis Center, and the Community Psychology Program.

Diagnostic and Therapeutic Services: The Section of Psychology is particularly active in the development and delivery of health care services in the Medical Center. Consultation on the traditional psychological, psychiatric, and neuropsychological conditions is provided throughout the Medical Center. Specific diagnostic and consultation services are also provided in areas of pain, aging, chronic disease, rehabilitation, psychosomatic problems, tension states, cognitive and emotional changes in persons undergoing medical treatments, and problems in patient management. As part of this approach, both traditional and innovative treatment approaches are offered. The Department serves as an active referral resource for problems ranging from somatic complaints without physical findings to more acute disturbances seen in relation to medical trauma. Treatment for such persons in addition to traditional ambulatory outpatient care, include behavioral management, short-term counseling and psychotherapy, and crisis intervention as well as involvement in the family system. This type of consultation and treatment is marked by close interdisciplinary collaboration with physicians and other support services.

Neuropsychology Service: The Neuropsychology service provides comprehensive consultation on the behavioral, psychological, and social sequelae of disorders of the central nervous system, and contributes to the management of patients suffering from acute and chronic neurological disorders and organic psychopathologies. The clinical and research activities of this group are consultative and collaborative as well as independent, insofar as they involve other components of this department and other departments within the Medical Center. A special cognitive screening battery has been designed to assist in the differential diagnosis of the senile and presenile dementias, the focal manifestations of vascular and neoplastic disease, epilepsies, toxic states, and other conditions (e.g., psychopathologies) which affect cognitive function. In addition to diagnostic consultation, direct therapeutic service may be offered in collaboration with the Office of Behavioral Studies of this Department.



involving the use of biofeedback in the management of pain and in neuromuscular reeducation. The neuropsychology service is in direct support of patient care in collaboration with the Johnston R. Bowman Health Center for the Elderly, and the Departments of Neurology, Neurosurgery, Cardiovascular Surgery, and Orthopedic Surgery.

Office of Behavioral Studies: The Office of Behavioral Studies is a treatment and referral source for complicated medical/psychosomatic problems. Its programs combine newer psychological technologies such as biofeedback and relaxation with traditional psychotherapeutic methods and bring these to bear on complex health problems. A wide range of medical conditions are seen which often are not amenable to cure through the application of medical regimens. Such conditions include chronic tension, chronic headache, pain disorders of various etiologies, neuromuscular disorders, hypertension, asthma, GI distress, speech disorders, and post-CVA conditions. Patients with arthritis, lung disease, and other chronic conditions are seen in consultation to help identify and facilitate adaptational changes. The programs of the Office are directed to both outpatients and hospitalized individuals. The staff maintains close working relationships with other disciplines in the medical setting, and patient management is typically in an interdisciplinary program. The Office provides diagnostic interviewing and testing, behavioral management, brief psychotherapy, and staff consultation, as well as the application of relaxation training and biofeedback for the amelioration of symptoms.

Pediatric Psychology: Pediatric Psychology is a program of psychological services, consultation, teaching, and research organized within the Department of Pediatrics. The staff of four child psychologists provides diagnostic and therapeutic services to children from birth to 18 years of age, and their families. Patients are both medical inpatients and outpatients, presenting problems ranging from the more traditional areas of child psychopathology such as difficulties with school or family, to management of problems resulting from acute to chronic illness. Preventive intervention is emphasized, and developmental evaluations and other screening procedures are frequent referral requests. Therapeutic strategies are based on conceptualizing problems in individual and interactional terms using a variety of theoretical frameworks. The active focus of therapy varies from the entire family, to family subgroups, to individual therapy.

Children's Therapeutic Day School: This program, staffed largely by child psychologists with conjoint appointments in the Department of Psychiatry, offers year-round day treatment to children, ages 5 to 13, who have serious difficulties adjusting at school or at home, and who therefore do not profit from the usual neighborhood school experience. With an average enrollment of 40 children, the program provides a comprehensive focus on the child through educational, social, psychological, and family services, while maintaining the child in his home and community setting. The goal is to prevent the development of more serious psychiatric disorders while providing a constructive therapeutic intervention. The primary objective of this program is to provide the necessary educational help and comprehensive therapeutic intervention to reintegrate the child into a regular school setting within a period of two years. Individual and group psychotherapies are provided for children; family therapy is preferred for the families of these children. Psychologists provide program administration and direction, diagnostic assessment, psychotherapy, and consultation, in collaboration with social workers, special educators, occupational therapists, nurses, psychiatric residents, and psychiatric consultants. The ongoing program, staff, activities, and physical setting constitute a milieu which provides a model of open, adult-staff, peer group, and adult-child relationships.

Multiple Sclerosis Center: In this comprehensive diagnostic and treatment center for persons with multiple sclerosis, the clinical skills of neurologists and psychologists are combined to provide medical diagnosis and management as well as behavioral and psychological evaluation and intervention. Psychologists provide for individual assessment of each patient's personal and adaptational status and relate this to programs of individual, marital, family and group counseling. Educational and adjustment programs of the Center form the principle mode of behavioral intervention, directed towards the normal individual undergoing unusual long-term stress.

Community Psychology: Psychologists on the staff of the Mile Square Health Center hold faculty appointments in this department. These psychologists are primarily responsible for a program of community mental health services including Sustaining Care Programs, Community Day Treatment programs, Outpatient Diagnostic and Therapeutic Services, Diagnostic Services for Developmental Disabilities, and Work Release programs. A multidisciplinary staffing pattern and team approach are seen as essential in providing quality service in diagnosis, treatment, psychosocial and vocational needs of community patients. Outpatient programs address the needs of children and adults, including a crisis intervention program to provide immediate resource for individuals in crisis. A school psychologist provides special corrective and preventive programs for the early detection and remediation of developmental, educational, and learning disabilities. An art therapy program provides alternate modes of expression for elementary school children in special adjustment classes. A weight

control program is conducted in collaboration with the department of medicine, utilizing relaxation and behavioral techniques in managing and eliminating over-eating. With the Department of Obstetrics and Gynecology a program for the care of young, pregnant women who show signs of emotional disturbance has been developed. Thus, programs provide direct care and treatment for mentally ill individuals, and also include new multidisciplinary programs targeted to the health care needs of a variety of underserved populations.



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Department of Health Systems Management

Richard C. Jelinek, Ph.D., Acting Chairperson

Gerald A. Masek, Ph.D., Acting Director, Section of Computer Sciences

Faculty

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Block, A.	Freeman, J.	Lerner, W.	Shirk, M.
Brownlee, E.	Freund, L.	Maher, J.	Sinioris, M.
Campbell, B.	Glessner, M.	Masek, G.	Thompson, L.
Cort, L.	Haussmann, D.	McNulty, T.	Warden, G.
Crane, E., Jr.	Inns, J.	Oder, D.	Weir, S.
DuFour, R.	Jelinek, R.	O'Shea, J.	Zieserl, R.
Esmond, T.	Kerr, J.	Petry, H., III	Zimmerman, R.

The Department of Health Systems Management was formally established in 1975. The Department's goals are: 1) to provide a graduate program for health systems managers; 2) to provide residency training and continuing education for health systems managers; and 3) to develop and apply research to improve the health delivery system.

The faculty consists of practicing administrative and systems professionals who teach and advise students in areas based upon actual management responsibility held by the faculty in the Medical Center. Faculty members function in diverse roles in administration, management consulting, finance, law and data processing. Educational and research programs are directed by faculty members working within health systems who apply as well as profess their knowledge.

Educational Activities

The Graduate Program In Health Systems Management

The Health Systems Management Program at Rush University is a graduate professional program designed to train individuals for careers that will focus on the major problems facing one of the nation's fastest growing industries. Graduates will be prepared to work with physicians, health scientists, nurses, hospital administrators, health planners, and others concerned with controlling costs, improving quality, and increasing the overall effectiveness and efficiency of the health care delivery system. Career possibilities for graduates are widely distributed among a variety of health systems and management-related positions. These include:

- Management/Staff positions within a single hospital or multi-hospital system in the private sector;
- Management/Staff positions within a Veteran's Administration, Public Health Service, or other public health sector facility;
- Health Systems research or development;
- Management/Staff positions in a consulting firm specializing in the improvement of the health care delivery system.

The Health Systems Management Program's approach takes students from a wide variety of academic backgrounds and provides a strong foundation in health care management and system/industrial engineering through the traditional didactic avenue and through a unique, practical, educational experience at Rush-Presbyterian-St. Luke's Medical Center and its network of affiliated institutions. The curriculum is designed for practicing professionals as well as students entering directly from certain baccalaureate level programs. Health managers orient their studies to become skilled in the utilization of systems analysis techniques intended to improve the operational components of a health facility, while systems specialists strive to become thoroughly familiar with the dynamics and nature of the health delivery system.

Professional Goals for Graduates

The Rush Health Systems Management Program is designed to give graduates certain specific professional strengths. They should be able to:

- function as general health systems managers with a commitment to continuous learning and the improvement of the health care system;
- synthesize principles and concepts of health delivery, health care management, and systems methodology in planning, implementing, and evaluating health care systems;
- apply problem-solving principles when making improvements in the health care delivery system;
- function independently and interdependently with other members of the health care team;
- relate findings of research to systems management and practice and explore areas for continued research;

—analyze the health care system and the manager's role in the context of interacting social, economic, and political systems.

Because the faculty recognizes that education does not stop with completion of the requirements for the degree, the program also aims to educate health systems managers who can cope with rapid changes in the patterns of health care and who can guide these changes effectively. Thus, the Rush program is designed to provide graduates with an educational base upon which to build a continuing learning program throughout their professional careers, either under their own initiative or in a formal doctoral-level program.

Curriculum

The Health Systems Management Program is structured around topics in three areas essential to the education of the health systems manager: Health Care Services, Systems Sciences, and Applied Studies.

The Health Care Services area focuses the student's attention on the various components of the health delivery system, the professional participants and their roles, and current issues impacting the system. In addition to clinical and administrative participation, the students review the relevant research and practice of social scientists, legal authorities, economists, and others who have applied their disciplines to problems drawn from the health delivery system.

The Systems Sciences area is designed to develop the student's ability to structure and solve operational and organizational problems in a quantitative manner. This area assists the student in recognizing the important parameters of management systems and ensures that, through experience in solving a wide variety of classical problems of various types, the student will be equipped with fundamental analytic skills to deal with a wide variety of management problems in the health delivery system.

As most professional advanced degree programs demonstrate, the crucial component of the student's experience is the guided, supervised application of knowledge in real and simulated professional practice situations. This program provides such experience in an Applied Studies component. This component consists of a set of structured systems analysis and management studies, formulated to expose the student to the definitions of problems where they exist and to the utilization of analytic and managerial skill in reaching realistic solutions. Where appropriate, students follow their recommendations through to full implementation and evaluation. The Applied Studies component utilizes the Rush system and its cooperating network affiliates as a laboratory, and the management of these institutions as adjunct faculty.

The Health Systems Management Program curriculum is designed with the flexibility required to meet the needs of students of various academic backgrounds. As a general rule, prospective candidates with an administrative or industrial engineering background should plan on four quarters to complete the program. Other candidates should plan on seven quarters. Since a prescribed level of academic preparation is necessary for graduation, the actual length of the program for an individual student will depend on the level of academic preparation at matriculation.

Course topics offered include: Organization and Management Theory applied to Hospital; Health Economics; Structure and Health Care Settings: Micro and Macro; Quantitative Methods; Health Systems Problems; Systems Analysis and Operations Research; Measurement of Systems Performance; Information Systems; Materials Management and Patient Care Systems; Organizational Analysis; Financial Management Systems; Treatment Process; and Health Programs and Facilities Planning.

Gaining Admission

Applications will be considered for enrollment beginning in the fall and winter quarters. Minimally, students should have received a baccalaureate degree from an accredited college or university. An academic record of scholastic excellence is an important consideration. Applicants with graduate credit in quantitative or administrative fields, seeking to complete their master's degree or obtain a second master's degree, are strongly encouraged to apply because such preparation may reduce the program length from seven to four quarters.

In addition to demonstrating the completion of a baccalaureate degree, students are expected to submit the following:

1. A completed application accompanied by the \$25 application fee.
2. A copy of official transcripts of all previous college and university studies.
3. Three letters of recommendation supporting their ability to pursue the program.
4. Scores from the Graduate Record Examination or the Graduate Management Aptitude Test.

Research Activities

A major objective of the Department of Health Systems Management focuses on research activities. This research includes studies in the smallest operational components of the Medical Center as well as computerized hospital-wide information systems, the evaluation and proposal of models for health care delivery, and the needs of the population served by the Rush University System and its affiliated and associated institutions. During the past few years specific research has been conducted in the areas of patient services, nursing services, hospital and university support services, management information systems and financial systems.

Research on patient services has ranged from an evaluation of outpatient programs in practicing clinics and the Emergency Room to the examination of uses of the inpatient facilities at Sheridan Road Pavilion and Johnston R. Bowman Health Center for the Elderly. Both nursing staffing and nursing productivity assessments have been conducted, with special emphasis placed on primary nursing care. Research in hospital and university support services has resulted in a unique system of evaluating housekeeping quality and financial and statistical indices for medical colleges. Project studies in management information systems areas have resulted in improved census systems, better attendance and overtime systems, and an evaluation of the implementation of the Spectra 2000 Medical Information System at Sheridan Road Pavilion. Cost pricing analysis and a systems analysis of the Medical Center budget process have been undertaken in financial systems research.

Service Activities

Members of the faculty of the Department of Health Systems Management provide service to the Medical Center through the management positions they hold. Hospital administrator, health care planners, academic managers, financial officers, corporate and labor attorneys and data processing managers function as both practitioners and teachers. The faculty is supported by managers outside the Medical Center who represent hospital and health care consultants, national associations and network institutions.

Many of the faculty members also provide service to the improvement of the health delivery system through outside committee work. Members of the faculty have represented the institution as well as the Department in activities sponsored by the American Hospital Association, Hospital Financial Management Association, American College of Hospital Administrators, Hospital Management Systems Society, and the Illinois Hospital Association.



Section of Clinical Nutrition
Section of Medical Technology

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Section of Clinical Nutrition

Dorice M. Narins, Ph.D., Director
E. Virginia Pinney, M.S., Associate Director

Faculty

Ayers, W.	Dolecek, T.	Narins, D.	Roland, D.
Castellanos, M.	Hart, J.	Pinney, E.	Vilas, N.

Research Activities

At the present time, there are three general areas of research: mineral metabolism, aberrations of growth including obesity and undernutrition, and evaluation of patient education techniques.

The section has several projects studying aspects of zinc metabolism. One project is to determine the zinc status of pregnant alcoholics and its relation to the development of their offspring. A second project is to determine the effect of zinc and/or copper supplementation on the altered taste perception of patients with cancer. A third project is to evaluate the trace mineral status of patients with cancer. It is anticipated that research in this area will be expanded to include studies of trace mineral status in other disease states.

Funding is being sought for studies of the effects of early feeding patterns on the development of obesity. A study of the effectiveness of various methods of weight control on adolescents is in progress. As more funds become available larger studies on the etiology of obesity and applied studies will be developed.

Research in patient education and evaluation of materials has been important in the past. It is anticipated that while these efforts will continue, they will constitute less of the total as the amount of basic research increases.

Service Activities

Members of the section consult and provide patient services for the Pediatric Genetics Clinic, Oncology, Adolescent Obesity Clinic, Preventive Medicine, and Medicine Intensive Care Unit.

Master of Science Program in Clinical Nutrition

Philosophy

The program leading to the Master of Science degree with a major in clinical nutrition is designed to give students a thorough knowledge of clinical nutrition, expertise and confidence in health team interaction, and skills in communication and teaching.

Because the vital relationship between nutrition and health is receiving greater recognition, the role of the clinical nutritionist has expanded. New expertise, the ability to assume more significant responsibility as a member of the health care team, and the ability to contribute to the education of practicing and future health professionals is required.

The clinical nutritionist works with physicians, nurses, nurse practitioners, social workers and other health care providers, all sharing a primary concern—the patient. Effective interaction and communication between these professionals are dependent upon a broad base of common knowledge. Because Rush University has organized its academic programs on the belief that cooperative activities focused on the patient are enhanced by interdisciplinary education, students in the clinical nutrition program take courses with graduate nursing students and with medical students.

Objectives

It is anticipated that, upon completion of the Master of Science program in clinical nutrition, the graduate will be able to:

- obtain nutritional history information and correlate it with physical, anthropometric, clinical and behavioral data to evaluate the dietary and nutrient status of the patient;
- advise and recommend to the physician or primary health care provider a feasible nutritional management program for the patient;
- function as a consultant to the entire health care team—physicians, nurses, physical therapists, social workers, and health students—regarding the nutritional care of the patient;
- function as a nutrition educator and coordinator of education in nutrition for health professionals as well as students of health professions such as medical, nursing, dietetics, nurse associate and related health students;
- function as an effective educator in nutrition for patients, their families, and community members; and
- function as a resource for nutrition information and guidance needed by the health care team, in the hospital and in the community.

Prerequisites

Applicants to the graduate program in clinical nutrition should have completed a baccalaureate degree from an accredited college in one of the fields of foods and nutrition, dietetics, biochemistry, biology or nursing, and the following courses:

Courses	Quarter Hours	Semester Hours
Chemistry, Inorganic, Organic and/or Biochemistry	16-18	12
Human Anatomy and Physiology	10-12	6-8
Microbiology	5-6	3
Statistics, Introductory	4	3
Human Nutrition	10-12	8
Nutrition in Disease and/or Diet Therapy	5-6	3-4
Behavioral Sciences	16-18	12
Economics	5-6	4
Total	71-86	51-54

Evidence of registration as a dietitian is preferred, but not required.

Eligibility

All factors are taken into consideration when evaluating each student's application. Students are not necessarily excluded or accepted into a program because of deficiencies or proficiencies in any one area. An applicant not meeting regular admissions requirements may, at the discretion of the Graduate Admissions Committee, be offered enrollment as a special student as defined below.

The graduate program recognizes three categories of students:

1. Regular students, who have been accepted for admission to the master's degree program;
2. Special students, who have not been accepted to the degree program but have permission to enroll in specific courses for academic credit (there is a limit of two courses in this category);
3. Auditors, who have obtained permission to attend a course but are not seeking academic credit (no academic grade is reported).

Method of Application

An application and recommendation forms for the clinical nutrition program may be obtained by writing:

Director of Admissions
The College of Health Sciences
Rush University
600 S. Paulina
Chicago, Illinois 60612
(312) 942-7100

Applicants to the graduate programs in clinical nutrition should make certain that the following material is on file at the College of Health Sciences at least four weeks prior to the beginning of the term of expected matriculation:

1. completed application;
2. \$25 application fee;
3. three letters of recommendation;
4. results of the Graduate Record Examination (G.R.E.).

Typical Curriculum (subject to variation)

Fall Quarter		Quarter Hours
NUTRI 523	Assessment of Nutritional Status. Identification of the best methods of collecting, recording and analyzing physical signs, biochemical and anthropometric data, and diet intake. Assessment of the nutritional status and writing of diet and educational plans for clients.	3
NUTRI 541	Practicum I. Clinical practice in implementing and evaluating nutritional care.	1
NUTRI 565	Seminar in Nutrition I. Student presentations of recent literature. Speakers and guests. Students must register for three quarters.	1
PHYSO 511	Nutritional Physiology I. Discussion of particular physiological systems and relation to principles of nutrition.	4
PPHYS 576	Nutritional Pathophysiology I. The pathophysiology and medical management of disorders related to nutrition and nutritional status. Corequisite: PHYSO 511.	2
Winter Quarter		
BIOCH 451	Biochemistry I.	4
HLCED 583	Clinical Investigation I	2
NUTRI 542	Practicum II. Continuation of NUTRI 541.	1
NUTRI 566	Seminar in Nutrition II. (See above)	1
PHYSO 512	Nutritional Physiology II. Continuation of PHYSO 511.	4
PPHYS 577	Nutritional Pathophysiology II. Continuation of PPHYS 576.	2
Spring Quarter		
BIOCH 452	Biochemistry II	4
HLCED 584	Clinical Investigation II	2
NUTRI 501	Nutritional Interrelationships I. A study of the dynamic interaction between the animal and its environment, particularly the diet. Chemical and metabolic phenomena involved in the development and maintenance of the mammalian organism. Regulation as a means of adaptation. Emphasis on understanding requirements for specific nutrients in individuals and populations, evaluation of food intakes and dietary habits, and on nutritional needs during pregnancy and lactation, growth and maturation, and disease.	2
NUTRI 543	Practicum III. Continuation of NUTRI 512.	1
NUTRI 567	Seminar in Nutrition III. (See fall quarter)	1
Summer Quarter		
NUTRI 502	Nutritional Interrelationships II. Continuation of NUTRI 501.	2
NUTRI 544	Practicum IV. Discussion of student-presented cases and clinical care conferences. In addition, for 18-20 hours of clinical practice per week, the student has responsibility for assessment, planning, implementing and evaluating nutritional care.	6
NUTRI 531	Nutritional Self Study. Students assess their own food intakes, dietary habits and nutritional needs by consuming a diet which they might design for a patient.	1
NUTRI 591	Independent Clinical Study. Intensive clinical nutrition study on a subject and in a setting agreed upon by the student and advisor. Prerequisite: HLCED 584.	2-5
Total required courses		48
Electives		6
Minimum required for graduation		54

Electives must include at least two credits in HCADM, HCSYS, HLCED or HLSOC course work. Most students will take an elective each term.



Section of Medical Technology

Marjorie Stumpe, M.A., Director

Herb Miller, M.H.S., Assistant Program Director

John P. Ayer, M.D., Medical Director

Faculty

Carr, M.
Chung-Bin, A.
Kachmar, J.

Kaplan, R.
Lee, N.

Miller, H.
Siegel, J.

Stumpe, M.
Tarr, M.

Educational Activities

Bachelor of Science Program in Medical Technology

Students interested in the undergraduate medical technology program are encouraged to submit applications to the affiliated colleges of their choice (see pp. 98) soon after the beginning of their senior year in high school. A college preparatory program in high school which includes chemistry, biology, physics and mathematics is the best preparation for enrollment in any of the affiliated colleges.

Each college has its own entrance requirements. A student accepted at an affiliated college for the Rush program will file an Intent to Register form with the College of Health Sciences to formalize participation in the program. The student's academic progress will be monitored by both Rush and the health careers advisor of the affiliated college. All candidates for admission must provide evidence of good physical and mental health.

Students meeting the objectives of the pre-health curriculum and obtaining the approval of both the health careers advisor and the Dean of the College of Health Sciences will move to the Rush University campus to pursue the final two years of the program.

Due to limited enrollment, students already enrolled in one of the affiliated colleges in another program and students desiring to transfer to an affiliated college for the Rush program must be approved by the health careers advisor and the Admissions Office at Rush.

Applications may be obtained by writing to the Director of Admissions of any of the affiliated colleges.

Transfer Applicants. The College of Health Sciences also considers a limited number of transfer applicants at the third year level in addition to students who complete the pre-health curriculum at an affiliated college. Selection is competitive, and only the most qualified applicants will be accepted. Only those spaces not filled by Rush students from affiliated colleges will be available for transfer students. Many transfer applicants have been college graduates as well as students who have attended non-affiliated colleges.

All applicants must have satisfactorily completed the pre-health curriculum at an accredited college or university. Rush University does not offer the pre-health curriculum on its campus. No transfer credit is awarded for required course work in which the student earned less than a "C" grade. Required courses should be taken for a grade rather than a pass-fail option.

Transfer applicants apply directly to the College of Health Sciences. It is advisable to apply early in the academic year preceding the intended year of matriculation. Guidance in course selection is available through the Admissions Office at Rush.

Applications for transfer students may be obtained from:

Director of Admissions
College of Health Sciences
Rush University
600 S. Paulina
Chicago, Illinois 60612
(312) 942-7100

A non-refundable application fee of \$25 must accompany the application, as well as transcripts from high school (including test scores), from all colleges and universities, three recommendations, and a personal interview. A health form must be submitted prior to registration.

When the application is complete, all items are reviewed and evaluated. If required course work is still in progress, an offer of acceptance is contingent upon satisfactory completion.

Curriculum

At the College of Health Sciences the program leading to the Bachelor of Science degree with a major in medical technology requires successful completion of the pre-health curriculum at an affiliated campus, and the upper division study at the Rush University campus.

Philosophy

The contribution of medical technology to the health care delivery system and to the patient is primarily one of diagnostic services. With the expansion of clinical medicine in the variety and number of diagnostic tests performed, and the intricacies of new methods and instruments used, there is a crucial need for more high-quality professionals—not merely more technologists. Today's professional technologists must not only develop technical expertise, but teaching and administrative competence as well. They must be able to adapt to rapid changes in the field, and at the same time, perform at an optimal level. As members of the health care team, medical technologists must have a basic understanding of the role of other health practitioners in order to function effectively and bring the best possible care to the individual and the community. Although the work in medical technology often does not place the practitioner in actual physical proximity to the patient, the technologist, nevertheless, must maintain a high degree of compassion and empathy and a constant awareness that the welfare of the patient is the ultimate goal.

It is the aim of the Rush University baccalaureate program in medical technology to educate technologists to meet the changing needs of laboratory medicine more effectively and with greater efficiency.

Objectives

The objectives of the program in medical technology are to provide educational experiences which will enable the student to:

- acquire knowledge and proficiency in the technical skills required in the medical technology profession;
- develop problem-solving abilities in the application of scientific theory to the clinical practice of medical technology;
- acquire the basic principles of management to assist in the supervision of medical technologists and other supportive level laboratory personnel;
- appreciate the importance of continuing education as an avenue of professional growth;
- acquire an understanding of the roles of other members of the health care team and an ability to function cooperatively within the team;
- appreciate and practice professional ethics in providing quality health care to the patient and to the community.

Pre-Health Curriculum

The pre-health portion of the medical technology program is taken at an affiliated college and requires two or three years of study, depending upon the college. These years are devoted to preparing the scientific foundation upon which the practice of medical technology can be built. The first year emphasizes courses in biological, physical and behavioral sciences, with options in the humanities. The succeeding pre-health years are used to increase depth in the sciences as they relate more specifically to health fields, and to enhance personal experience by a broad choice of electives in the humanities.

Each affiliated college has a unique participation with Rush. Specific course offerings and requirements may vary from campus to campus due to curricular offerings, scheduling, and course content. Each pre-health curriculum is different, but all provide the background necessary for the professional component of the program in the final two years. The following listing suggests the kinds of courses which are normally required before a student comes to the Rush campus.

Pre-Health Curriculum

Courses	Quarter Hours	Semester Hours
Chemistry, Inorganic	10-12	8
Quantitative Analysis	5-6	4
Chemistry, Organic	5-6	4
Human Anatomy and Physiology	10-12	8
Microbiology	5-6	4
Statistics, Introductory	4	3
Behavioral Sciences (Psychology, Sociology or Anthropology)	18	12
Academic Electives	33-26	17
Total	90	60

Upper Division Studies

Following the pre-health curriculum, upper division studies are devoted to completing the professional segment of the program leading to the Bachelor of Science degree with a major in medical technology.

The comprehensive technical curriculum at Rush University prepares the student to enter the practice of medical technology. Each graduate is eligible to take the National Certifying Examination given by the American Society of Clinical Pathologists, and upon passing the examination becomes certified as a Medical Technologist, MT(ASCP). The program is accredited by the American Medical Association's Council on Medical Education.

In the junior and senior years the student integrates the theory of clinical medicine with the practice of clinical laboratory procedures, learning basic theory and skills in hematology, clinical chemistry, immunology and clinical microbiology in the junior year, and going on to more advanced courses in those areas in the senior year. Senior students apply basic concepts as they rotate through the laboratories of Presbyterian-St. Luke's Hospital. In addition, students are prepared to fill supervisory and teaching positions through courses in management and instructional design.

Baccalaureate Medical Technology Curriculum

(Typical program, subject to individual variations*)

Third Year

Fall Quarter		Quarter Hours
MEDTK 301	Basic Laboratory Skills	4
MED 401	Body Fluid Analysis	4
BIOCH 301	Basic Biochemistry	4
IMMUN 301	Basic Immunology	3
		15

Winter Quarter

MEDTK 302	Patient Care Techniques	1
MICRO 311	Diagnostic Bacteriology	5
IMMUN 402	Clinical Immunology	2
IMMUN 403	Clinical Serology	2
IMMUN 421	Immunohematology	3
MEDPH 311	Medical Physics I	4
		17

Spring Quarter

MED 301	Hematology I	5
BIOCH 401	Clinical Chemistry I	5
MEDPH 321	Medical Physics II	4

Fourth Year

Fall Quarter		Quarter Hours
MED 425	Hematology II	4
MED 435	Advanced Morphology	2
MEDTK 421	Practicum in Clinical Chemistry	6
HCADM 301	Health Care Management	3
		15
Winter Quarter		
MEDTK 423	Practicum in Immunology	3
MEDTK 422	Practicum in Hematology	6
BIOCH 421	Clinical Chemistry II	5
	Elective	0-3
		14-17
Spring Quarter		
MICRO 411	Parasitology, Mycology, and Virology	5
MEDTK 425	Practicum in Immunohematology	3
MEDTK 424	Practicum in Microbiology	6
MEDTK 441	Seminar in Medical Technology	2
	Elective	0-3
	Medical Grand Rounds	0
		16-19
Subtotal		90
Pre-Health Curriculum		90
Total		180

*Courses may not be always offered in sequence listed.

Service Activities

The majority of our faculty are actively involved in the clinical laboratories of Rush-Presbyterian-St. Luke's Medical Center, maintaining either an active research or clinical position in their area of specialty. Several of our faculty hold joint appointments in Rush Medical College. Our program faculty and resources span the gamut of clinical laboratory medicine and, therefore, we actively support and participate in all areas where technical, laboratory application is involved.

Department of Religion and Health

Christian A. Hovde, Ph.D., D.D., the Bishop Anderson Chairperson
Bernard Pennington, M.Div., Director, Clinical Pastoral Services

Faculty

Bice, M.	Friberg, J.	Jais, R.	Taylor, J.
Bronersky, L.	Grindler, D.	Katonah, J.	Ulrich, L.
Corrigan, J.	Halter, M.	Nelson, S.	Wagner, W.
Fitchett, G.	Hovde, C.	Pennington, B.	

Research Activities

The research efforts of the Department are in their infancy. Until recently, the Department has been functioning as a service and training department and has not been actively engaged in research. Research is now being incorporated into the training of Clinical Pastoral Education (CPE) theological students. Areas now being investigated include:

- a) Attitudinal changes to life crises following educational process.
- b) Faith systems and their effect on mobilization of physical resources.
- c) Religious symbolism and patient/family support systems.

Educational Activities

The Department of Religion and Health is responsible for providing pastoral care to patients, their families or supporting persons, and the staff personnel who serve them within the Rush-Presbyterian-St. Luke's Medical Center. Additionally, the Department provides an accredited program in clinical pastoral education for pastoral personnel, humanistic and theological studies within the Colleges, and research in the area of religion and health.

Accredited by the Association for Clinical Pastoral Education, the Department offers basic, advanced, and supervisory education in pastoral care. This program is oriented to graduate theological students, pastors, members of religious orders, or other health personnel who are interested and involved in pastoral care and counseling in the midst of a health crisis. Under faculty supervision, students carry direct responsibilities for ministry within patient care areas on an ecumenical basis which includes a sensitivity to particular parochial practices. Students use clinical pastoral education in preparation for parish ministry, chaplaincy, teaching, pastoral counseling, or CPE supervision.

Basic Clinical Pastoral Education. An intensive 11-week introduction to pastoral care, Basic CPE focuses on models of ministry and their effect in patient care. Viewing the patient as a partner in learning, students engage in theological reflection and using pastoral resources with patients and health personnel, they work toward better understanding of the interface between theology and behavioral sciences in understanding the human condition.

Advanced Clinical Pastoral Education. Advanced CPE is a year-long residency program for persons who have already completed their basic theological degree and have had pastoral experience, and who want a pastoral care specialization, such as certification as a chaplain through the College of Chaplains, American Protestant Hospital Association. Students function as pastoral members of interdisciplinary health teams to develop the capacity to utilize their pastoral perspectives and competence with a variety of pastoral encounters.

Supervisory Clinical Pastoral Education. Supervisory CPE is designed for qualified persons who have demonstrated pastoral, professional competence, and who want to specialize in supervision in preparation for certification with the Association of Clinical Pastoral Education. Students are helped to develop both a theory and theology of pastoral practice, a philosophy of CPE which includes understanding appropriate educational models' theory and practice, and a versatility in using supervisory skills and methods.

The program of Religion and Health is currently being developed to enlarge upon existing course offerings for interdisciplinary and clinical experiences within the various colleges of the University. The Bishop Anderson Professorship has been established for teaching in Religion and Health. The primary concentration of teaching in this program has been in thanatology, ethics, and philosophy of medicine.

Service Activities

The department provides round-the-clock religious ministry to patients in the hospital, providing sacraments, church services, individual counseling and grief ministry to any person who is in need of them. It is available to support members of the student body and staff and to respond to emergencies when needed.

Courses Offered

A. Clinical Pastoral Education

Course Title: The Art of Healing: A Theological Perspective and Pastoral Practice

Description: An 11-week (one quarter), intensive clinical course focusing on the interpersonal dimensions of the healing process; an appreciation of the patient as a total being; an exploration of the anxieties and inhibitions generated in relating to the sick; specialized communication skills, seeing the patient as a partner in the healing task; assisting the student to discover and use his own uniqueness in relating therapeutically to the sick.

Note: Students may be accepted for this course from any discipline or field of study. The descriptions of seminars which follow are built upon the experience of teaching the course for theological students. However, no difficulty is inherent in incorporating non-theological students into the course.

Note: The course may be repeated. Each repetition is at a progressively more sophisticated level.

Prerequisites: For theological students: at least one year of graduate theological education *and* an interview with one of the faculty of the Department of Religion and Health.

For non-theological students: an interview with one of the faculty of the Department of Religion and Health.

(1)

Seminar: Clinical Case Conference

Faculty: Supervisory/Visiting Staff

Time: Two Times Per Week at 90 Minutes Each

Clinical seminar using verbatim written materials or tape recordings of actual patient visits by students. One student presents material each seminar period; all students present in a sequence which they construct. Verbatim materials are circulated to seminar members in advance of the seminar to allow careful preliminary study.

The supervisor and the seminar members engage the presenting student in an examination of his ministry. Together they explore the student's understanding of the patient's communication, the student's assessment of the patient's pastoral needs, the student's attempt to carry out an appropriate ministry, the student's ability to use his own faith meaningfully in his ministry, and the meaning of the student's subjective response to patients.

(2)

Seminar: Sermon Preparation and Delivery

Faculty: Supervisor

Time: One Time Per Week at 90 Minutes

Students prepare a sermon manuscript and give the sermon in the hospital chapel with their seminar group as the audience. Seminar then relocates and the preaching experience is examined in terms of its appropriateness to the hospital congregation, its articulation of the faith, its witness to the faith and development of the student, and its effectiveness as interpersonal communication. Usually these sermons are amended and given during a Sunday worship service in the hospital chapel.

(3)

Seminar: Personal and Professional Concerns

Faculty: Supervisor

Time: Two Times Per Week at 90 Minutes Each

This seminar gives students the opportunity to report spontaneously on critical events and issues in their hospital ministry, to examine issues of personal or professional identity, to examine problems in communicating or functioning within the seminar group, to explore the meaning and context of their ministry, their relations with other medical center disciplines, their ability to think theologically about their experience, to examine individual problems of functioning effectively in the pastoral role, and to assist students in evaluating their progress in training.

(4)

Seminar: Didactic Presentations

Faculty: Supervisor and Invited Staff

Time: One Time Per Week at 90 to 120 Minutes

Presentations are made by professionals in other disciplines, by supervisory staff, and by students themselves in an attempt to bring theoretical material to bear on the practical work of ministry and to assist the student in clarifying his operational concepts.

From time to time the Didactic Presentations are more structured to cover various important topics. Some subjects which have been presented in the past or which will be covered in coming quarters include:

Suffering: Its Importance for Health. This seminar explores the various philosophical and theological responses to suffering and their expression among hospital patients. The implications of the different responses to suffering for healing are explored.

Aging, Faith and Health. A brief survey of the important biological, psychological, and social changes which accompany aging sets the background for an exploration of the role of faith in the life of older persons, and particularly in their adjusting to and coping with illness.

Faith as a Factor in Health. A brief survey of the major theories of disease and health, scientific and unscientific, Western and non-Western, forms the background for a review of the literature on the role of faith, trust and hope in recovery from illness. Case examples from student's experience are also reviewed.

(5)

Individual Supervision

Faculty: Supervisor

Time: 1 to 2 Hours Per Week

Supervisor and student together develop an individualized contract for learning. The student is enlisted as a partner in the learning process by helping him identify his goals, plan for his learning, and evaluate his progress. Written records of pastoral work are examined in detail as well as written and oral attempts of the student to understand and incorporate the values from the total program experience and to synthesize the clinical, theological, and theoretical data encountered. Supervision of the student on the floor while seeing patients is also provided.

The Art of Living

(6)

Guided Study or Research

Faculty: Supervisor

Time: Hours to be Determined

Each student is expected to undertake a reading or research program which is complementary to his learning goals and/or remedial in terms of gaps in basic preparation for understanding pastoral care. Supervisor is consultant to the student for the study program. Note: Expected of year-long students only.

(7)

Clinical Practice

Faculty: Supervisor and Staff

Time: 20 to 30 Hours Per Week

(A) Each student has a designated area of pastoral responsibility, usually 40 to 50 beds. Student is assisted to develop working relationships with the treatment team and to develop a style of coverage appropriate to the area.

(B) Each student serves once per week as on-call chaplain for overnight or weekend coverage and/or spends an evening visiting with preoperative patients. These special duties involve the student in ministry in situations of crisis or heightened anxiety.

(C) Clinical practice requires special arrangements for non-theological students.

(8)

Comprehensive Evaluations

Faculty: Supervisor

Each student prepares a written evaluation of himself and the total program experience. This evaluation is shared with the supervisor and fellow students and examined with the student in seminar and individually. The evaluation periods help the student to examine his investment in learning, his goals, his use of program resources, his relationships, and his progress toward learning goals. The supervisor prepares a detailed written evaluation of the student at the end of the program which is usually shared with the student. The comprehensive evaluations are necessary for determining satisfactory completion of the course and giving credit where appropriate.

The course may not be taken more than twice for academic or field work credit.

(9)

Students are encouraged to participate in the teaching programs of the hospital pertinent to their clinical field, within the limitations of their primary educational programs and clinical responsibilities.

B. Courses offered to University students in general

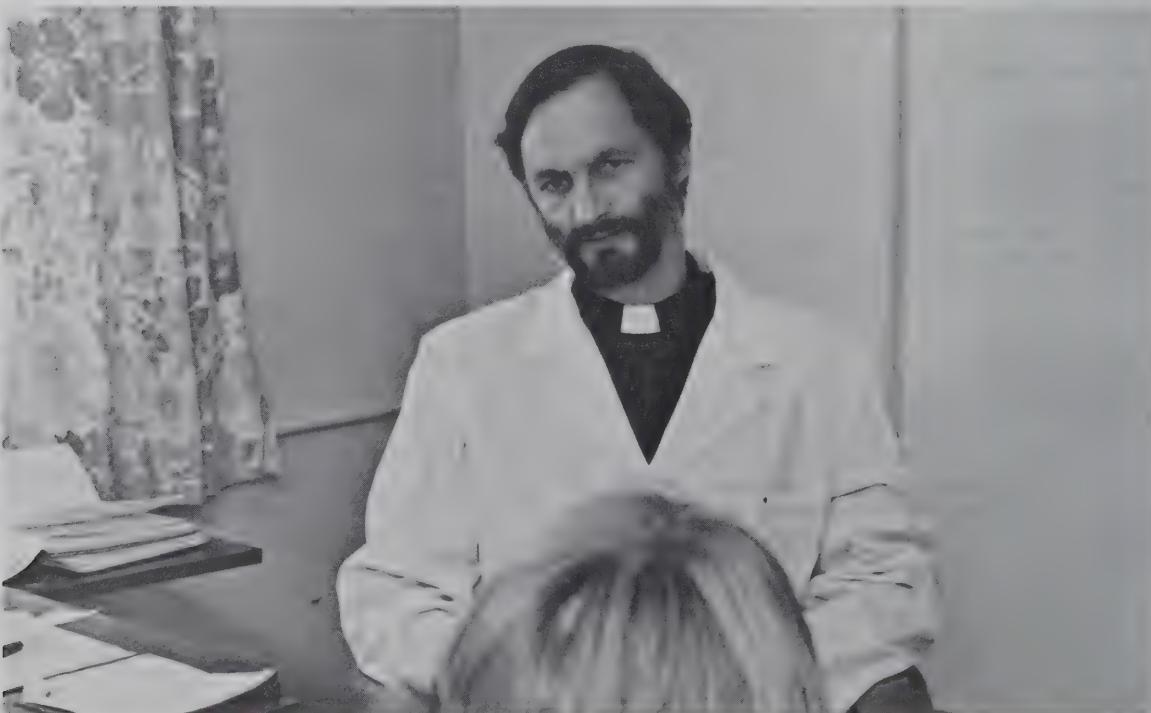
461 Behavior: Death and Dying

Social, cultural, emotional and religious factors involved in the grief process surrounding death. Investigation of the environment in which death occurs and its effect on the quality of life possible. Offered each quarter *except* Summer. Seminar form; permission of faculty required.

462 Behavior: Death and Dying

Builds on #461 as a prerequisite. Uses the clinical experience of the students to address questions of support of individual patients and their families, personal reactions of medical personnel to patient death and their own concepts of death. Offered each quarter *except* Summer. Seminar form; permission of faculty required.

On occasion, individual study projects may be arranged for credit for students who wish to pursue a specific portion of this material in greater detail.



Academic Policies

Credit

Credit Hours. The quarter hour is the unit used by the College of Health Sciences for determining credit for courses taken at the Rush University campus. One quarter hour generally represents a lecture or seminar meeting one hour each week, or a laboratory or clinical experience of two or three hours per week (sometimes more) for the ten weeks of the quarter. An examination for each course generally is given during the 11th week.

Full-time students will carry a course load of 12 to 17 hours each quarter.

Outstanding students may petition the Dean to register for additional courses. Written approval is required. Degree candidates must also obtain permission for less than full-time course work.

Part-Time Study

Undergraduate students normally must plan on full-time course work.

Graduate students may enroll for courses on a part-time basis. However, all prerequisites for a specific course must be met before admission to the course. Part-time graduate students must complete degree requirements within 36 months. The program director has the discretion to make special arrangements in some cases. Students enrolling on a part-time basis may be able to switch to full-time enrollment depending upon availability of courses and approval of their program director.

Absences

Students are fully responsible for all material presented in class sessions. Students are expected to attend all seminar and clinical practice periods, and are fully responsible for all content presented therein. When illness or other special circumstances prevent attendance, the student must inform the instructor in advance, when possible, in order to plan for meeting objectives on an individual basis. Students absent from a final examination will receive a zero for that examination or an incomplete for the course as determined by the course director.

Examinations

The examination policy is the responsibility of the individual course director, who will inform students of examination requirements for that particular course. A period at the end of the quarter is provided for final examinations. This period may be used as the course director chooses.

Transfer of Credit

Undergraduate courses taken at a recognized college or university which fulfill the pre-health curriculum requirements may be applied toward the baccalaureate degree in medical technology at Rush. Elective credit may be fulfilled by upper division courses taken at another institution.

Graduate level courses taken at a recognized college or university may be applied to the Master of Science degree at Rush, subject to the approval of the program director. Credit in excess of nine quarter hours requires approval of the Dean.

Concurrent enrollment at another institution must be approved by the Dean. An Off Campus Study Form, available in the Office of the Registrar, must be submitted to the Dean within 30 days prior to commencement of the concurrent study.

Registration

Registration for a new term is normally completed in an announced pre-registration period during the preceding term. Students must be registered and in attendance no later than Monday of the second week of each quarter or they will be dropped from the class roster. Registration, dropping and adding courses, and withdrawal from school must be done by completing forms provided by the Office of the Registrar.

Registration is complete only after tuition and fees have been paid in full or deferred payment contracts have been signed with the Office of Financial Affairs. Students may attend classes only after they have completed registration. Students registered in a course but failing to participate will receive "F" grades.

Identification cards. Each student receives an identification card at matriculation. Each term the card is validated at the completion of registration. A valid card is needed for identification within the Medical Center complex, for use of the library and for admission to some events.

Independent Study. With written permission from the program director, a student may pursue an independent reading or independent clinical study. A preceptor works with the student in designing, monitoring and assessing the course work. A student interested in this option must fill out an Independent Study Contract six weeks before the quarter the course is taken. Contracts are available in the Office of the Registrar.

Adding or Dropping a Course

After the registration form has been accepted by the Office of the Registrar, students may add or drop courses by completing a form provided by that office. The student's advisor must sign these forms before they will be accepted. Monday of the second week of the quarter is the last day to add a course.

The official date of withdrawal from a course is determined by the date the completed form is returned to the Office of the Registrar. If a student withdraws by the end of the first week of classes, the course will not appear on the academic record. A "W" grade will appear on the record if the withdrawal occurs between the beginning of the second week and midterm. After midterm a "WP" or "WF" grade will be recorded depending on whether the course director considered the student to be doing passing or failing work at the time of withdrawal.

Leave of Absence

A Health Science student who must interrupt his or her studies for reasons such as sustained ill health or compelling personal situations may apply for a leave of absence for a stated period of time, usually not to exceed one year. Leave of absence requests must be submitted in writing to the Student Evaluation and Promotion Committee and the program director. If approved by them and by the Dean, the student must satisfy the conditions of the leave before reentering and must comply with all policies, requirements and course sequence in effect at the time of reentry. The student will pay tuition and fees at the rates in effect at the time of reenrollment.

Withdrawal from School

Students planning to withdraw from school voluntarily must complete a form available in the Office of the Registrar. The student will obtain appropriate signatures while returning all Medical Center materials, the identification card, and name pin. Withdrawal is final once all Medical Center bills have been paid and the completed forms submitted to the Office of the Registrar.

Grades

Transcripts and Grade Reports. Grades are recorded on the student's permanent academic record in the Office of the Registrar. A transcript of the academic record becomes official only when signed by the Registrar and bearing the corporate seal of Rush-Presbyterian-St. Luke's Medical Center.

Official transcripts are released only by written request. Forms for this purpose are available in the Office of the Registrar for on-campus students. There is no fee for this service.

Transcripts will not be released until the student has paid all bills due the Medical Center.

Quarterly grade report forms are sent to the student's local address as soon as grades are recorded each term. This is a student copy only and it should not be accepted by any institution or agency in lieu of an official transcript.

Grade Point Average. Each student maintains a grade point average for all work completed at Rush using the grading system described below. The grade point average is determined by dividing the number of points received by the number of credit hours attempted in which A, B, C, D or F grade was received. This computed grade point average is not affected by courses taken on P/N basis or by courses transferred from another institution. These courses are added to the credit hour total only.

Grading System. The following grades are used to report the quality of work at Rush:

Grade	Quality	Grade Points
A	Excellent	4
B	Good	3
C	Satisfactory for undergraduate but below the level expected of a graduate student	2
D	Minimal passing	1
F	Failure	0
P	Passing	-
N	No passing	-
I	Incomplete work	-
W	Withdrawal prior to midterm of the quarter	-
WP	Withdrawal after midterm—quality of work was passing at the time of withdrawal	-
WF	Withdrawal after midterm—quality of work was failing at the time of withdrawal.	-

Undergraduate Student Grades. Undergraduate students are expected to perform at the "C" or better level.

A grade of "P" or "N" is given for elective courses at the discretion of the instructor and in some cases when the student petitions, not later than the first week, to take the course on a P/N basis with the instructor's permission.

The grade of "I" is normally given only when circumstances beyond the control of the student prevent completion of course requirements. Students receiving a grade of I are responsible for finding out from the instructor the exact work required to remove the Incomplete. In the case of a required course, work shall ordinarily be completed and a letter grade received by the end of the fifth week of the next quarter the student is enrolled or sooner at the discretion of the instructor and course director. An I grade not removed by midterm will revert to a final grade as determined by the course director. A grade of Incomplete in an elective course will automatically revert to an F or N grade unless a change of grade is received by the Registrar within one calendar year.

Dean's List. Undergraduate students earning a 3.5 or higher grade point average for at least 12 credits for a quarter are given recognition by having their names placed on the Dean's List.

Graduate Student Grades. Graduate students must maintain a 3.0 grade point average and may repeat a course in which a C, D, or F has been assigned. These courses may be repeated only once but the grade for the repeated course replaces the first grade in the cumulative grade point average.

Graduate students may request an Incomplete from the course director. An I grade not removed by midterm of the next quarter will revert to a final grade as determined by the course director.

Elective courses taken in other colleges of the University may be taken for a pass or fail grade. If a student wishes to obtain a letter grade for one of these courses the student must negotiate with the instructor within the first week of the course.

Academic Progression

The faculty reserves the right to request the withdrawal of any student whose conduct, health or performance demonstrates lack of fitness for continuance in a health profession. Any such student not voluntarily withdrawing will be dismissed from the University.

Undergraduate Progression. High academic performance in required courses is expected. Undergraduate students will be considered in good standing at Rush University unless placed on Academic Probation.

Academic Probation is assigned to any student who receives a quarterly grade point average below 2.0 or whose cumulative grade point average falls below 2.0. Students placed on probation have two quarters in which to regain the status of good standing. Failure to do so will result in dismissal from the University. Medical technology students may receive no more than one D in the following courses each year to remain in the program:

BIOCH 401, 421

IMMUN 301, 402, 421

MICRO 311, 411

MED 301, 401, 425, 435

MEDTK 301, 421, 422, 423, 424, 425

An F grade in any of these courses will result in dismissal.

No D grade in a practicum course of the program is acceptable for graduation.

A D grade in such a course may be repeated only once.

Graduate Progression. Students must maintain a cumulative grade point average of 3.0 in order to remain enrolled. Only grades of A, B or C may fulfill degree requirements in all required courses as listed in the curriculum outline. A clinical nutrition student who earns a C grade in NUTRI 541, 542, 543, or 544 must make special arrangements with the program director to repeat that work. Less than a C grade in these courses will result in dismissal from the program.

A student whose cumulative grade point average falls below a 3.0 may enroll for one quarter as a probationary student to attempt to raise his or her cumulative grade point average. Further enrollment will be denied if the grade point average is not raised in that quarter.

Reenrollment

Any student who has withdrawn from a program and has not been enrolled for two consecutive quarters or any dismissed student may apply for readmission by submitting an application for this purpose with a fee of \$25.00 to the Office of Admissions. Applications for reenrollment must be received at least one quarter before the planned return. Reentering students must meet the conditions for reenrollment stated in their dismissal or reentry acceptance letter, all policies, requirements and course sequence in effect at the time of reentry. The student will pay tuition and fees at the rates in effect at the time of the reenrollment.

Requirements for Graduation

Bachelor of Science. The Bachelor of Science degree, with a major in medical technology, requires a minimum of 180 quarter hours. This includes at least 90 quarter hours earned as a lower division student at an affiliated school, or before entrance as a transfer student.

Candidates for the Bachelor of Science degree must earn a 2.0 cumulative grade point average in all computed upper division credits taken at Rush University.

Participation in cap and gown at commencement exercises is expected of all graduates.

After receiving the baccalaureate degree, graduates are eligible to take the National Certifying Examination given by the Board of Registry of the American Society of Clinical Pathologists.

Graduation Honors. Candidates for the Bachelor of Science degree who have demonstrated academic excellence are honored at commencement exercises by the Rush University faculty each spring. Those earning a 3.4 or better grade point average based on six quarters at Rush are awarded the Bachelor of Science *Cum Laude*; those with 3.6 or better, *Magna Cum Laude*; those with 3.8 or better, *Summa Cum Laude*. This is based on six quarters of work at Rush and does not include any work done at other institutions.

Master of Science. The Master of Science degree requires a minimum of 54 quarter hours. A cumulative grade point average of 3.0 is required. All requirements for the degree must be completed within 36 months.

Candidates for the Master of Science degree are urged to participate in the commencement exercises in June, though many will complete degree requirements in the following August.

Student Records

The Family Educational Rights and Privacy Act of 1974 protects the privacy of current and former students enrolled in most educational institutions.

Students currently enrolled at Rush University will be notified annually of the educational records policy of the University and of their rights under the Act and under the federal regulations promulgated pursuant to the Act.

Rush University has six official student records. A student or former student may inspect and review these records after making an appointment with the appropriate office. The records and their locations are as follows:

1. Official Academic Record (transcript); Office of Registrar, 1 Scheppe-Sprague.
2. Registrar's Folder-Contains admission application, transcripts from other schools, registration information; Office of Registrar, 1 Scheppe-Sprague.
3. Dean's Folder-Contains written evaluation of clinical work, curricular flow charts, grade report copies; Offices of the Program Directors, Clinical Nutrition and Medical Technology, 4 Scheppe-Sprague; Religion and Health, 7 Scheppe-Sprague; Health Systems Management and the Graduate School, Office of the Dean, 4 Academic Facility.
4. Financial Affairs Folder-records showing all billing and payments, notes and correspondence dealing with a student's finance; Office of Student Financial Affairs, 1 Scheppe-Sprague.
5. Financial Aid Folder-all information concerning financial aid for the student; Office of Financial Aid, 1 Scheppe-Sprague.

Students may request a copy of any portion of their records from the holder of that file. The request must be in writing, signed, specifically identify the record desired and include the student's major, year and social security number. There is no charge for copies of the student transcript. Other reproductions cost 50¢ per page. The University honors requests as long as there is no outstanding obligation to the Medical Center. Students within commuting distance may be asked to review the desired data in person.

Students may request that the University amend information in their records which they believe to be inaccurate, misleading or which violates their privacy. If the University refuses to amend the records as the student wishes, he/she may request a hearing in order to challenge that decision. A hearing will be granted. Students may place in their educational records statements commenting upon information in the records and/or stating their grievances with a decision not to amend the record.

Those administrators who maintain the records adhere to a policy of limited access for administrators and faculty having a need for information in order for their offices to function, to determine academic progress or to designate award recipients.

Any disclosure of a student's record to others not listed in these policies must have prior written consent of the student. Requests for information and letters of consent of the student are kept with the records.

A student may waive any of his/her rights under the Act and its regulations.

A student may file a written complaint with the Family Educational Rights and Privacy Act Office regarding alleged violations of the General Education Provisions Act and its regulations.

Copies of the Act and these written policies and procedures may be obtained from the Office of the Registrar, 101 Scheppe-Sprague.

Directory Information

Certain information classified by Rush University as directory information: student's full name, local address and phone number, date and place of birth, home town, major field of study, year in school or class, participation in officially recognized activities, dates of attendance, degrees and awards received, previous educational institutions attended by the student and previous majors, and degrees and years earned.

Each Fall Quarter the Rush Student Address Book is published for student, faculty and staff use. It contains the student's name, local address and phone number, major, and class.

At the time of commencement exercises this information is released in public announcements: student's full name, degree and major, previous institution and degree (s) and year (s) earned and home town.

Students may restrict the release of any item of information which is considered as directory information on a form provided in the Office of the Registrar, 1 Scheppe-Sprague, on or before October 15 each year or the end of the second week of the quarter following matriculation.

Human Investigation

Any project or study involving human subjects must have approval of the Medical Center Committee on Human Investigation. Studies in the community as well as within the Medical Center must have this approval. The Office of Research Affairs handles all requests and has established the protocol for proper investigative procedures.

In furtherance of the nation's commitment to end discrimination on the basis of handicap, and in accordance with the provisions of Section 504 of the Rehabilitation Act of 1973 and all regulations properly issued thereunder to protect the rights of handicapped persons, it is the Medical Center's policy that: No program or activity administered by Rush-Presbyterian-St. Luke's Medical Center which receives Federal financial assistance shall exclude from participation, deny benefits to or subject to discrimination, any individual solely by reason of his or her handicap.



Financial Affairs

Expenses

Expenses listed in this section apply to third and fourth year students in the undergraduate program and all students in graduate programs. Expenses for the first years of undergraduate study will depend upon tuition, fees, room, board, and other expenses at the affiliated college attended.

All expenses listed in this section are current estimates of cost levels as of the beginning of Fall term 1977. The actual charge of tuition and fees is subject to change without notice, and other budgetary costs used in the determination of financial aid eligibility may also vary somewhat. Institutions utilizing federal aid funds, including Rush, derive living expense levels based upon Bureau of Labor Statistics at the moderate level. Students receiving financial aid must conform their living expenses to these allowable budgets.

Undergraduate: The estimated expenses of a full-time single undergraduate student in the College of Health Sciences are as follows:

	per quarter	per academic year of three quarters
Tuition	\$1,000.00	\$3,000.00
Activity Fee (Fall quarter only)	10.00	10.00
Insurance	40.00	120.00
Books and Supplies	100.00	300.00
Housing and Food (estimated dormitory expense)*	500.00	1,500.00
Transportation	100.00	300.00
Personal	150.00	450.00
	\$1,900.00	\$5,680.00

*Students not living in dormitories will be likely to have higher costs.

Living expenses \$250.00 per month. (includes Housing, Food, Transportation, and Personal).

Students who are married or who have dependent children will, of course, incur greater living expenses.

Graduate: The estimated expenses of a full-time single graduate student in the College of Health Sciences are as follows:

	per quarter	per academic year of four quarters
Tuition	\$1,200.00	\$4,800.00
Activity Fee (Fall quarter only)	10.00	10.00
Insurance	40.00	160.00
Books and Supplies	100.00	400.00
Housing and Utilities	658.00	2,633.00
Food	225.00	900.00
Transportation	110.00	440.00
Personal	150.00	600.00
	\$2,493.00	\$9,943.00

Living expenses \$381.00 per month. (includes Housing, Food, Transportation and Personal)

Students who are married or who have dependent children will, of course, incur greater living expenses.

Description of Expense Categories

Undergraduate Tuition: Full-time students taking from 12 to 17 credits are assessed \$1,000.00 per quarter. Part-time students taking from 1 to 11 credits are assessed \$85.00 per credit. ANCHOR coverage is included in tuition.

Graduate Tuition: Full-time students taking from 12 to 16 credits are assessed \$1,200.00 per quarter. Part-time students taking from 1 to 11 credits are assessed \$100.00 per credit. ANCHOR coverage is included in tuition.

Activity Fee: An activity fee of \$10.00 for full time students and \$5.00 for part-time students will be assessed fall quarter.

Room and Meals: Since students at Rush University may live in a variety of settings, expenses will vary. Expenses for those living in the residence halls at Illinois Institute of Technology are \$1,510.00 for a double room. Meals (seven-day plan) are included.

Books: Books and supplies such as uniforms average approximately \$100.00 per quarter.

Personal Expenses: Personal expenses typically include insurance, clothing, entertainment, laundry, toiletries, etc.

Transportation: Students should budget about one dollar per day for public transportation. Parking in the Medical Center garage is \$1.50 per day, or \$40.00 per quarter with a key card. Students coming to the campus from out-of-state should also budget for at least two round trips per year.

Enrollment Deposit: A \$50.00 enrollment deposit is required of all students (including affiliated students) accepted for entrance in fall, prior to matriculation. This assures a place in the entering class. This deposit is non-refundable and applies toward payment of the first quarter tuition.

Application Fee: A non-refundable application fee of \$25.00 must accompany the application.

Readmission Fee: Students who have withdrawn or been dismissed from a program must reapply and pay the \$25.00 readmission fee.

Payment of Tuition and Fees

Tuition and fees are to be paid or satisfactory arrangements for payment made with the Office of Student Financial Affairs before registration is complete. Students may not attend classes until after they have completed registration. Any exception to this policy must be approved in writing by the Office of the President.

No transcripts or degrees will be issued for a student who has not made satisfactory arrangements for payment of any financial obligations to Rush-Presbyterian-St. Luke's Medical Center.

Students have the responsibility to complete one or a combination of the following courses of action by *Friday of the first week of classes* to avoid dismissal from the University for nonpayment of tuition and fees:

1. *Pay total tuition and fees for the quarter.*

2. *Complete a Deferred Payment Plan Contract.* This plan requires that one-third tuition, all fees, and a \$15.00 service charge be paid by Friday of the first week of classes. Additional payments of one-third tuition are due on the fourth and eighth Monday of the quarter. Forms are available in the office of Student Financial Affairs.

3. *Complete a Financial Aid Late Payment Form.* This form, initiated by the student and completed by the Financial Aid Office, is to be filed when the student is receiving external aid and when that aid has not arrived at the University by the beginning of the term. This would occur, for example, when a Guaranteed Loan is needed to pay tuition and the proceeds from the bank have not been received by the beginning of the quarter. For that portion of tuition and fees not covered by this external aid, the student must complete step one or two above for the remaining amount. Forms are available in the Office of Student Financial Aid.

Those students who have not made satisfactory arrangements will be informed on Monday of the second week of classes, or as soon as possible thereafter, that they are in the process of being dismissed from the University. However, the notification will also inform the students that they can reverse this procedure with no penalty upon making satisfactory arrangements as specified above, by Friday of the second week of classes. Those students who do not make satisfactory arrangements will be dismissed from the University, and their names will be removed from final class rosters. Such students will not be admitted to clinical, laboratory, or didactic class sessions.

Students who do not comply with this last opportunity for making satisfactory arrangements will be assessed 20 percent of tuition, which is the amount charged to those who withdraw for any reason during the second week of classes.

Students who choose the Deferred Payment Plan Contract and who fail to make a payment on the specified due dates have until Friday of the week in which payment is due to make the payment. On Monday of the following week, they will be notified that they have been dismissed and have until Friday to make the payment and be reinstated with no penalty. Failure to make payment results in dismissal from the University, forfeiture of credit for the quarter, and forfeiture of any previous payments made.

Students who wish to reenroll the following quarter or year should contact the Registrar of Rush University.

Any student dismissed under this policy will:

1. Be covered by Anchor/Blue Cross for the remainder of the quarter if the appropriate fees are paid.
2. Be dismissed from on-campus student housing.
3. Lose locker and mail privileges.

Refunds

Official withdrawal from a course, or from the College, entitles a student to a refund of tuition according to the schedule listed below. No other fees are refundable.

A student may receive a 100 per cent refund if withdrawal is during the first calendar week in which classes begin. Otherwise, refunds will be made as follows:

Second week - 80 percent refund

Third week - 60 percent refund

Fourth week - 40 percent refund

Fifth week - 20 percent refund

After fifth week - no refund

Financial Aid

Rush University administers its financial aid program without regard to sex, race, color, religion, creed, or country of national origin, and is committed to a program of equal opportunity.

Undergraduate Students

Purpose. The purpose of the financial aid program for undergraduate students of Rush University is to attempt to provide financial assistance to all admitted students in need of such assistance so that Rush University can be a viable choice of schools for *all* who desire to attend, regardless of financial circumstances. To the extent that they are able, parents and students are expected to provide a degree of support for the student, the expected support being measured under a standard set of criteria by either the College Scholarship Service or the Educational Testing Service. It is the responsibility of the Office of Student Financial Aid at Rush University to attempt to provide and coordinate various programs of financial assistance for the student to make up the difference between what it costs the individual to attend Rush University and what the family and student are reasonably able to contribute towards the student's educational expenses.

"Packaged" Financial Aid. In order to fulfill the purpose of the financial aid program, the Office of Financial Aid will need to draw upon various sources of financial aid and bring them together in "packaged" form for the individual. In varying quantities, a financial aid package may include scholarships/grants; loans, and occasionally, employment.

Application Procedure. For the student to be considered for financial aid from Rush University and to insure that one's potential for aid from outside sources is maximized, the undergraduate student should diligently file the following documents:

1. Rush University application for financial aid, submitted to the Rush University Office of Student Financial Aid.
2. Financial Aid Form (FAF), or Graduate and Professional School Financial Aid Service statement (GAPSFAS). The Rush University code number to be used on either of these forms is 3263 for College of Health Sciences students.
3. Illinois State Scholarship Commission (ISSC) Monetary Award application. The code number to use is 382.
4. Basic Education Opportunity Grant (BEOG) application.
5. Applications for aid from any outside foundations or agencies for which the student might be eligible. The student should research these possibilities independently as well as in conjunction with the Financial Aid Office.
6. Illinois Guaranteed Loan program application. (Optional, but takes on increasing significance when federal programs are being funded at low levels.)

Note: No value judgment is made by the Office of Student Financial Aid about student dependency. Rather, the strict federal definition of student independence must be adhered to by all schools participating in federal financial aid programs. For a student to be considered emancipated and therefore self-supporting, the following three criteria must *all* be satisfied:

1. The student cannot have been claimed as a tax dependent by *anyone* other than self or spouse during the calendar year *previous* to the calendar year in which aid is being applied for, as well as the calendar year itself in which aid is being requested.
2. The student cannot have lived at the home of parents or other guardians for more than two consecutive weeks during the period of time in (1) above.
3. The student cannot have received \$600.00 or more from parents or other guardians during the period outlined in (1) above. If all three of the above criteria are met, the parents need not supply financial information on the GAPSFAS form. However, in order that the student's responses to the above inquiry be properly attested to, the *parents must* complete a notarized affidavit of non-support and return it to the Financial Aid Office. Such a document is required by federal regulation and is available in the Office of Student Financial Aid.

Renewability of Financial Aid. The student must resubmit *all* financial aid application forms each and every year in which financial aid is being requested. Renewability will be generally contingent upon student's being in good academic standing and having continued financial need, and upon availability of funds for student aid.

Application Deadline. For the student to receive consideration for aid from Rush University, the above documents should be on file in the Financial Aid Office by May 1st preceding the student's September enrollment. As a result, the student and family should plan to submit the Basic Grant application, Illinois Monetary Award application, and FAF or GAPSFAS by early March in order for results to arrive by May 1st. The remainder should be on file by May 1st. Late applications will be considered for assistance but generally only if funds remain after distribution to on-time applicants. Late applications not the fault of the student will be considered as if received on time.

Counseling Services. The Office of Student Financial Aid is available on a daily basis to consult with students and parents on all matters regarding the financing of a Rush University education. Students and parents are welcomed and encouraged to make use of these services.

Graduate Students in Related Health Sciences

Purpose. The purpose of the financial aid program for graduate students at Rush University is to provide sufficient assistance to students to allow them to attend at the graduate level. Such assistance will generally be based upon the financial need of the student. Financial aid dollars available for graduate students are highly dependent upon various sources of funding, the relative availability differing among departments and from year to year.

Application Procedure

1. Submit a Rush University application for financial aid to the Rush University Office of Student Financial Aid.
2. Submit a Graduate and Professional School Financial Aid Service statement (GAPSFAS). The Rush University code number to be used is 3263 for students in the College of Health Sciences.
3. At the option of the student, submit an application for an Illinois Guaranteed Loan. This program takes on increasing significance when federal and other outside programs are being funded at low levels.

Application Deadline. For the student to receive the most favorable consideration for aid from Rush University, the applications should be on file by May 1st preceding the student's fall enrollment. Late applications will be considered on a rolling basis if funds remain after the distribution to on-time applicants. Students admitted after May 1st, or who are enrolling for a term other than fall, will be given a reasonable time to submit the application.

Renewability of Financial Aid. A student's financial aid will generally be renewed each quarter, if funds permit, and if the student remains in good academic standing and continues to have financial need.

Counseling Services. The Office of Student Financial Aid is available on a daily basis to assist students with financial planning and resource availability. Students are welcomed and encouraged to make use of these services.

Scholarships/Grants

The above-outlined application procedure for undergraduate and graduate students will give the student consideration for programs described below in alphabetical order. The student should take care to note whether programs are available for undergraduate or graduate students.

Basic Educational Opportunity Grant Program (BEOG). A federal grant (gift aid) program based solely upon the student's financial need, designed to provide the first portion of an undergraduate student's aid package for those students with the greatest need. Awards currently range up to a maximum of \$1,400 per year. Students apply directly to the federally-designated processing agency and receive back a Student Eligibility Report (SER).

The student must then forward this SER to the Financial Aid Office where the amount of the student's award will be computed.

If the student is not eligible for an award, one copy of the SER should nonetheless be forwarded to the Financial Aid Office as evidence of the student's having applied for the program. Students who possess a baccalaureate degree are ineligible for the Basic Grant. Applications may be obtained from the Financial Aid Office.

Faculty Wives Scholarship. A scholarship fund for Rush University students has been established by a generous contribution from the wives of the faculty. These scholarships will be awarded on the basis of academic potential and financial need.

Illinois Medical Technology Association Scholarship. The Illinois Medical Technology Association (IMTA) scholarship of \$300 is awarded yearly to a medical technology student in either the sophomore, junior or senior year of college work. The scholarship is awarded by character, financial need, academic aptitude, and vocational promise.

Illinois State Scholarship Commission (ISSC) Monetary Award Program. A state grant program designed to help meet the financial needs of Illinois students attending the Illinois schools. Awards currently range up to a maximum of \$1,550 per year and are strictly based upon financial need. Students apply directly to the Scholarship Commission and receive a notification of status informing them of the level of their award. Students who have completed more than 225 quarter hours of study or who have attained a baccalaureate degree are ineligible for the State Scholarship Program. Applications can be obtained from the financial aid office or from:

The Illinois State Scholarship Commission
102 Wilmot Road
Deerfield, Illinois 60015

Johnson Products Foundation Scholarship. Scholarships are provided by the George E. Johnson Foundation to needy and deserving minority students. Students secure applications from and make applications directly to the Johnson Products Foundation, 8522 S. Lafayette, Chicago, Illinois, 60620.

Rush University Scholarships. A limited number of scholarships generally become available each year through contributions from private donors.

Supplemental Educational Opportunity Grant (SEOG) Program. A federal gift aid program distributed to undergraduate students on the basis of financial need. Funding at the federal level has kept this program rather small.

Loans

Illinois Guaranteed Loan Program. A loan program in which students make application directly to participating lending institutions (banks, savings and loan associations, credit unions, etc.), the State of Illinois acting as guarantee agent for the funds. Eligibility for the principal of the loan is generally determined by the lending institution through the Financial Aid Office. Often, interest on the loan is paid for the student by the government while the student is in school, the Financial Aid Office determining the student's eligibility for the interest benefits. Applications are available at the lending institutions; a small supply is also allotted to the Financial Aid Office for distribution.

National Direct Student Loan Program. A campus-based federally-funded loan program, wherein funds are awarded by the Financial Aid Office to undergraduate and graduate students on the basis of financial need. The principal repayment and interest charges are deferred until 9 months after the student ceases attendance. Interest is at the simply compounded rate of 3 percent per annum. The loan fund under this program is a revolving fund, providing for loan repayments to become future loan funds for other needy students at Rush University.

Employment

College Work-Study Program. A federal student employment program wherein students work part-time to help meet the costs of attendance. Work under this program is approved by the Financial Aid Office and is based upon the financial need of the student.

Institutional Employment. Some opportunities exist for the student to work part-time within the institution. The student should be mindful, however, that the academic workload will severely restrict and occasionally preclude one from working during the academic term.

The Graduate School

Executive Committee:

David I. Cheifetz, Ph.D., Dean

Paul E. Carson, M.D.

Robert S. Eisenberg, Ph.D.

Henry Gewurz, M.D.

Alexander P. Osmond, Ph.D.

Arthur V. Pruspan, Ph.D.

Charles L. Schauf, Ph.D.

Anthony J. Schmidt, Ph.D.

Howard H. Sky-Peck, Ph.D.

Lauren G. Wolfe, Ph.D.

The Graduate School

General Information

At the present time, the mission of the Graduate School within Rush University is the preparation of graduate students for the degree of Doctor of Philosophy in the basic biological and behavioral sciences. The degree of Doctor of Philosophy is given in recognition of high attainment in a particular field of scientific research, as evidenced by submission of a dissertation showing power of independent investigation and forming a contribution to existing knowledge.

In the newness of its organization, the Graduate School faculty sees the opportunity to avoid the rigidities which often characterize graduate education. A community of scholars should have scholarship as its motivation; disciplinary and departmental boundaries should not limit the setting of a single goal for students, that of excellence in research and its application. The Graduate School faculty hopes to provide individualized and flexible scholarly paths for its students. It wishes to avoid arbitrary imposition of uniformity and the encumberance of unnecessary formality. It is hoped such an environment will enable students to arrive at the doctoral level still invigorated by ideas. Achievement of such a climate requires adaptation to the needs of students, with the limitation in numbers of students implicit in such an approach.

Administration of graduate school programs is based on the formation by the faculty of divisions of graduate study. These divisions may be disciplinary or multidisciplinary in character. They come into existence for the sole purpose of providing graduate education; their continued existence is entirely dependent upon their demonstrated ability to provide such education at high levels of excellence. The divisions of the graduate school are seen as being flexible and responsive to changing needs and experiences in their areas of education. To that end, the divisions are headed by directors who serve for definite terms and whose re-appointment is subject to review at periodic intervals. Each division of graduate study is responsible, through its Director, to the Dean and the Executive Committee, the latter being made up of directors of all graduate divisions, with the Dean as chairperson.

Although the Dean and the Executive Committee hold ultimate responsibility for programs of the Graduate School, the divisions of graduate study retain significant latitude in structuring and administering their own programs. Aside from general Graduate School requirements, the divisions may, with approval, construct such additional or more specific requirements as their faculties deem desirable. Therefore, this section of the bulletin restricts itself to the statement of general Graduate School requirements. Students interested in admission should consult the program description of the division of their interest to ascertain special divisional requirements.

Resources

Graduate students have available to them the clinical research and instructional facilities of the entire Medical Center. These include the following:

- Within an 18-building Medical Center complex, the clinical resources of Presbyterian-St. Luke's Hospital with 864 beds; a center for the elderly with 176 rehabilitation beds; clinical diagnostic laboratories; an outpatient mental health facility; and the many other clinical and administrative services associated with a large teaching Medical Center.
- The research laboratories of the Medical Center, organized around ongoing faculty and student research programs in a wide variety of biological, behavioral, medical and surgical areas of inquiry.
- The research and study resources of the Academic Facility, a newly completed, \$25.5 million teaching facility containing laboratories, lecture and study halls, carrels, the university library, and a communications skills center.
- The Center for Educational Resources, which supports all instructional activities for faculty and students, including the library, learning resource center with its audiovisual study carrels, computer-assisted instruction, Biomedical Communications, and curriculum and evaluation.
- The Library of Rush University, which serves the entire University campus, is the oldest medical library in the city of Chicago. It is administered by a staff of professional medical librarians. The library has approximately 80,000 volumes, subscribes to 1,200 periodical titles, borrows documents from inter-library loan, and processes MEDLARS, MEDLINE and AVLINE requests for patrons. New monographs and reference books are acquired at a rate of over 2,000 each year. The Library has an outstanding collection of rare medical books available for research and study.
- The Animal Resources Facility, providing housing and laboratory services for animals required in ongoing research and teaching.

- Appropriate access to the Data Center of the Medical Center for scientific computer use. Hardware capabilities are built around an IBM 370/145 system. Software capabilities include APL, a completely interactive terminal-base language; conversational remote job entry, available for program development and submission of FORTRAN jobs; International Mathematic and Statistical Library, a complete library of scientific applied mathematical and statistical routines; and other software packages developed for specific purposes, such as SSP and SPSS. By arrangement, consultative services can be obtained from Data Center personnel.

- The Electronics Facility, which serves the clinical and basic science community of the Medical Center with electronic instrumentation design and development capabilities.

- The Research Machine Shop, which provides the Medical Center with the resources necessary for the design and fabrication of experimental devices and mechanical instrumentation.

Admission

Categories of Admission. There are three categories of admission to the Graduate School: (1) regular graduate students, (2) non-degree students, and (3) visiting scholars.

Regular Graduate Students - Students with advanced degree objectives must have the following qualifications to be considered for admission as regular graduate students:

1. They will ordinarily be expected to hold baccalaureate degrees from colleges or universities of recognized standing. Under special circumstances, individuals who do not have baccalaureate degrees will be considered for admission if they have completed studies equivalent to those required for a baccalaureate degree program at Rush.

2. They must show promise, as judged by academic performance and experience, of ability to accomplish advanced study and research and must have adequate preparation in their chosen fields of study. Applicants must submit complete official transcripts of all previous college and university studies.

3. In addition to the above general qualifications, individual divisions of graduate study may specify other qualifications or stipulate particular forms of the general qualifications. Individuals having an interest in admission as regular graduate students should inquire of the individual divisions of graduate study concerning requirements for admission.

Non-degree Students - Such students are not admitted with advanced degree objectives and are not eligible to become candidates for advanced degrees under this classification. Subclassifications are:

1. *Temporary Graduate Students* - admitted on the basis of the educational services which can be provided them to meet their individual needs, other than degrees. A limited plan of study, for credit but not part of a degree program, may be developed. Auditor's status, not for credit, may also characterize temporary graduate students.

2. *International Special Students* - limited to *sponsored* foreign students studying in areas to meet objectives not appropriate for advanced degree programs.

Visiting Scholars - Visiting professors, postdoctoral fellows, and other visiting scholars who have attained doctoral status or the equivalent may attend classes as visitors without payment of fees. This privilege will be granted upon approval by the director of the graduate division in which the work will be done and approval of the dean of the Graduate School. No registration fee is required, and no credit is given for courses attended. Persons in this category who may wish to receive academic credit must register as graduate students and pay the appropriate fees and tuition.

Non-faculty members of the administrative, instructional, technical, scientific, research, library and patient care staffs of the Medical Center, who meet the regular requirements for admission to the Graduate School, are eligible to apply for admission as resident graduate students. The amount of graduate work such students may take will be determined by the terms of their employment. In view of the limited numbers of students admitted to regular graduate status, it must be understood that students applying for full-time residency receive priority.

Rush University faculty members holding professorial rank or classified as instructors may take graduate courses. They may also become candidates for degrees, but approval of their candidacy requires special petition to the Dean and consideration by the Graduate School Executive Committee, in addition to the usual steps. In approving such candidacy, the Dean will set such additional standards as suit the circumstances, in all cases including the requirement that the candidate's dissertation committee be composed equally of Rush and non-Rush professors, and that the candidate have at least one advisor, in addition to his principal advisor, who is expert in the field of study concerned and is a non-Rush professor.

Admission Requirements

Basic requirements for admission are listed below. Applicants should note that individual divisions of graduate study may have additional requirements. *In all cases*, a student considering application for admission should first establish contact with the director of the division in which he or she plans to study, to determine divisional requirements.

1. An undergraduate record of scholastic excellence is an important consideration. Irrespective of undergraduate record, the process of application review searches for evidence of a high level of creativity and scholarly potential in the applicant.
2. Two copies of the official transcripts of all previous college and university studies must accompany the application for admission. Ordinarily these will include official record of the award of a baccalaureate degree from an accredited school.
3. A non-refundable application fee of \$25.00 must accompany the application. This fee is not refundable under any circumstance, regardless of the outcome of the application. Checks or money orders should be made payable to the College of Health Sciences. Applicants from outside the U.S.A. must remit the fee either by International Money Order or by a check drawn on a United States bank.
4. Undergraduate major and minor programs of studies should satisfy Graduate Division requirements.
5. The application must be accompanied by at least three letters of recommendation from college instructors or other supervisors of work, in support of the applicant's ability to pursue a scholarly program of independent studies and research.
6. The application must be accompanied by a personal statement in which the applicant indicates his or her reasons for wanting to do graduate work and describes the relevance of his or her goals and academic training to the program to which admission is being sought.
7. Applicants are expected to have decided upon their field of study before making application for admission and to *indicate only one* graduate program on the application form. A second or dual application for a different major for the same quarter will not be considered. Individuals who are uncertain about their objectives should communicate with the director of each graduate division in which they are interested and submit the application only when a definite choice has been made.
8. A current Graduate Record Examination, testing verbal and quantitative abilities, is strongly recommended. Individual graduate divisions may make this a requirement. Information regarding testing dates and locations may be obtained by writing the Educational Testing Service, Box 995, Princeton, New Jersey 08540. GRE scores should be directed to the graduate division of application.
9. Applicants whose first language is not English, and who cannot otherwise demonstrate their competence in this language, must take the Test of English as a Foreign Language (TOEFL), administered by the Educational Testing Service in some 95 foreign centers. Applications for the TOEFL Examination may be obtained from the Educational Testing Service, Box 995, Princeton, New Jersey 08540. This is a useful, indeed important, way of helping students determine whether they are well enough prepared to undertake graduate study conducted in English before they make extensive plans for graduate study in the U.S.A.
10. An interview of the applicant may be requested by the graduate division following preliminary review of the application.
11. In view of the competition for the limited number of places in the Graduate School enrollment, applications should ordinarily be completed three months prior to the anticipated date of admission to the graduate division program of choice. Applicants should determine from the director of their chosen graduate division the available entry dates. Some divisions have early deadlines or do not admit each quarter.

Admission Procedure

1. Submission of the applicant form, accompanied by the following: application fee; transcripts or arrangements for forwarding transcripts; letters of recommendation; personal statement.

Application materials should be mailed to:

Graduate School Admissions Office
600 South Paulina Street
Chicago, Illinois 60612

2. At the same time as Step 1 above, submission to the director of the chosen graduate division of the following: evidence in satisfaction of special divisional requirements; indication of forwarding of GRE scores as provided or required; indication of forwarding of TOEFL results as required.

3. In the early stages of processing the application, the student will be notified whether the application is complete or incomplete in the Graduate School Admissions Office. If it is incomplete, the missing items will be designated. If acknowledgement of receipt of application is not received within a reasonable period of time (four weeks), the applicant should inquire about the status of the admission file.

Processing by the Graduate School Admissions Office is limited to ascertaining that the file of required materials is complete and that the applicant meets the general requirements of the Graduate School for admission. As soon as this is accomplished, all the application materials are referred to the graduate division. There they are subjected to a more specific and intensive review.

4. The graduate division will review all materials and request such additions or clarifications as may be indicated. Following such review, the director of the graduate division will recommend to the Executive Committee of the Graduate School and the Dean action to be taken concerning admission of the applicant.

5. Notification to the applicant of action taken will come from the Office of the Dean. Although it is expected that applicants and graduate divisions will have extensive contact with one another, the Office of the Dean alone is empowered to make the formal offer of admission, taking the recommendations of the division and the Executive Committee into full consideration. The applicant should not rely upon receiving a response to the application, by way of acceptance or rejection, on or before any specific date after it has been referred to the division, nor should the applicant construe a lack of response as an intention to act favorably on the application.

Ph.D. Degree Regulations

The degree of Doctor of Philosophy is the highest earned degree conferred by Rush University. The Ph.D. degree is restricted to those scholars who have demonstrated superior ability in a recognized academic discipline. The Ph.D. degree is not awarded on the basis of time spent in residence, or following the completion of any specific number of formal courses, nor is the degree granted on the basis of miscellaneous course studies and research effort. The entire Ph.D. program must be rationally related, should be highly research-oriented, and should culminate in a thesis of literary and scholarly merit which is indicative of the candidate's ability to conduct original research in a recognized field of specialization. Ph.D. programs are directed by professors who work in close association with selected graduate students. In practice, such programs are composed of formal courses, guided individual study in a chosen field or discipline, study in such cognate subjects as may be required by the candidate's advisory committee, and original research which serves as the basis of a scholarly thesis.

For the most part, specific regulations governing the process which results in final award of the degree are developed by the graduate divisions responsible for the candidate's progress. While such regulations may differ in detail from one division to another, each division's program and regulations must be reviewed for approval by the Executive Committee of the Graduate School. In all cases, graduate divisions are required to be explicit and clear about regulations which will affect the candidate. This must be most stringently observed in divisional regulations concerning selection of principal advisors, advisory committees, and a plan of study. Similarly, divisions will be explicit and clear concerning procedures surrounding qualifying, preliminary and final examinations and will also be responsible for providing the candidate with the help and information needed to plan and conduct the thesis research.

At the same time, a major responsibility lies with the student to become familiar with the regulations and expectations of his or her chosen division. These regulations and expectations are included in this bulletin within the section devoted to each individual divisional program. It is considered to be the student's responsibility to remain knowledgeable about these programmatic regulations as they are set forth; they may change from time to time.

Policies and regulations applicable to all students are listed below:

- Rush University considers students for admission and academic progression without regard to religion, creed, or country of national origin, and is committed to a program of equal opportunity.
- Years of residence required by divisional programs are based on the definition that a student must be registered for a minimum of three subjects in each of three quarters to satisfy the Graduate School requirement of a resident year. Unless granted a formal leave of absence, regular graduate students who fail to register for three quarters in each academic year are considered to have withdrawn from the Graduate School and must compete for re-admission with all other applicants.

- For the Ph.D. degree there is no general Graduate School requirement of a foreign language. This requirement is determined by each division. Among the options decided by each division, where knowledge of another language is required, are the following: the number of foreign languages required, which foreign languages are acceptable, the type of skill required in acceptable foreign languages, whether satisfaction of a foreign language requirement at another graduate school or at an undergraduate college is transferable, and whether a non-English native language is acceptable.

- Some divisional programs may require the student to take one or more courses at a university other than Rush. It is the responsibility of the director of the graduate division concerned to make arrangements enabling satisfaction of such course requirements and to inform the student, prior to admission, of such costs and special arrangements as may be necessary.

- The quarter hour is the unit used by the Graduate School in determining credit for courses taken at the Rush University campus. One quarter hour generally represents a lecture or seminar meeting one hour each week, or a laboratory or clinical experience of two to three hours per week (sometimes more) for the ten weeks of the quarter. Full time graduate residence requires at least 12 and not more than 16 quarter hours per quarter. Outstanding students may petition the division director and the Dean to register for additional courses. Written approval is required. Degree candidates must also obtain written permission for less than full-time residence.

- Graduate level courses taken at any recognized institution may be applied to the Doctor of Philosophy degree at Rush if they are judged to meet divisional requirements, subject to the approval of the major advisor and the division director. Credit in excess of nine quarter hours requires approval by the division director and the Dean. Grades from courses transferred from another institution are not recorded on the student's academic record; the number of credits is recorded and added to the cumulative number of credits.

- Grades used to report the quality of a graduate student's work are:

Grade	Explanation	Grade Points
A	Performance at a superior level	4
B	Performance at a level sufficiently high for a graduate degree	3
C	Performance not consistently at the level needed for a graduate degree	2
D	Barely passing	1
F	Unsatisfactory performance	0
I	Incomplete work	-
W	Withdrawal	-
P	Passing	-

To be applied toward the Doctor of Philosophy degree, required courses must be passed with a grade of A or B. With the approval of the division director and course director, students may register for elective courses on a Pass-Fail basis.

- The faculty reserves the right to request the withdrawal of any student whose conduct, health, or performance, demonstrates lack of fitness for continuation in the degree program. Students may appeal such a request by the procedures outlined in the University Rules for Governance.

Financial Affairs

Expenses. Expenses listed in this section apply to all students in graduate programs. All expenses listed in this section are current estimates of cost levels as of the beginning of Fall term 1977. The actual charge of tuition and fees is subject to change without notice, and other budgetary costs used in the determination of financial aid eligibility may also vary somewhat. Institutions utilizing Federal Aid funds, including Rush, derive living expense levels based upon Bureau of Labor Statistics at the moderate level. Students on Financial Aid must conform their living expenses to these allowable budgets.

The estimated expenses for a full-time single graduate student in the College of Health Sciences are as follows:

	per quarter	per academic year of four quarters
Tuition	\$1,200.00	\$4,800.00
Activity Fee	10.00	10.00
Insurance	40.00	160.00
Books and Supplies	100.00	400.00
Housing and Utilities	658.00	2,633.00
Food	225.00	900.00
Transportation	110.00	440.00
Personal	150.00	600.00
	\$2,493.00	\$9,943.00

Living expenses \$381.00 per month (includes Housing, Food, Transportation and Personal).

Students who are married or who have dependent children will, of course, incur greater living expenses.

Description of Expense Categories

Tuition: Full-time students taking from 12 to 16 credits are assessed \$1,200.00 per quarter. Part-time students taking from 1 to 11 credits are assessed \$100.00 per credit. ANCHOR coverage is included in tuition for both full and part-time students.

Activity Fee: An activity fee of \$10.00 for full-time students and \$5.00 for part-time students will be assessed fall quarter.

Room and Meals: Since students at Rush University may live in a variety of settings, expenses will vary. Expenses for those living in the residence halls at Illinois Institute of Technology are \$1,510.00 for a double room. Meals (seven-day plan) are included.

Books: Books and supplies, such as uniforms, average approximately \$100.00 per quarter.

Insurance: All students must have hospitalization coverage (see Health Services and Counseling).

Personal Expenses: Personal expenses typically include insurance, clothing, entertainment, laundry, toiletries, etc.

Transportation: Students should budget about one dollar per day for public transportation. Parking in the Medical Center garage is \$1.50 per day, or \$40.00 per quarter with a key card. Students coming to the campus from out-of-state should also budget for at least two round trips per year.

Enrollment Deposit: A \$5.00 enrollment deposit is required of all students accepted for entrance in fall, prior to matriculation. This assures a place in the entering class. This deposit is non-refundable and applies toward payment of the first quarter tuition.

Application fee: A non-refundable fee of \$25.00 must accompany the application.

Readmission Fee: Students who have withdrawn or been dismissed from a program must reapply and pay the \$25.00 readmission fee.

Payment of Tuition and Fees

Tuition and fees are to be paid, or satisfactory arrangements for payment made with the Office of Student Financial Affairs, before registration is complete. Students may not attend classes until after they have completed registration. Any exception to this policy must be approved in writing by the Office of the President.

No transcripts or degrees will be issued for a student who has not made satisfactory arrangements for payment of any financial obligations to Rush-Presbyterian-St. Luke's Medical Center.

Students have the responsibility to complete one or a combination of the following courses of action by *Friday of the first week of classes* to avoid dismissal from the University for nonpayment of tuition and fees:

1. Pay total tuition and fees for the quarter.

2. *Complete a Deferred Payment Plan Contract.* This plan requires that one-third tuition, all fees, and a \$15.00 service charge be paid by Friday of the first week of classes. Additional payments of one-third tuition are due on the fourth and eighth Monday of the quarter. Forms are available in the Office of Student Financial Affairs.

3. *Complete a Financial Aid Late Payment Form.* This form, initiated by the student and completed by the Financial Aid Office, is to be filed when the student is receiving external aid and when that aid has not arrived at the University by the beginning of the term. This would occur, for example, when a Guaranteed Loan is needed to pay tuition, and the proceeds from the bank have not been received by the beginning of the quarter. For that portion of tuition and fees not covered by this external aid, the student must complete step one or two above for the remaining amount. Forms are available in the Office of Student Financial Aid.

Those students who have not made satisfactory arrangements will be informed on Monday of the second week of classes, or as soon as possible thereafter, that they are in the process of being dismissed from the University. However, the notification will also inform the students that they can reverse this procedure with no penalty, upon making satisfactory arrangements as specified above, by Friday of the second week of classes. Those students who do not make satisfactory arrangements will be dismissed from the University and their names will be removed from final class rosters. Students will not be admitted to clinical, laboratory, or didactic class sessions.

Students who do not comply with this last opportunity for making satisfactory arrangements will be assessed 20 percent of tuition, which is the amount charged to those who withdraw for any reason during the second week of classes.

Students who choose the Deferred Payment Plan Contract and who fail to make a payment on the specified due dates have until Friday of the week in which payment is due to make the payment. On Monday of the following week, they will be notified that they have been dismissed and have until Friday to make the payment and be reinstated with no penalty. Failure to make payment results in dismissal from the University, forfeiture of credit for the quarter, and forfeiture of any previous payments made.

Students who wish to reenroll the following quarter or year should contact the Registrar of Rush University.

Any student dismissed under this policy will:

1. Be covered by Anchor/Blue Cross for the remainder of the quarter if the appropriate fees are paid.
2. Be dismissed from on-campus student housing.
3. Lose locker and mail privileges.

Refunds

Official withdrawal from a course, or from the College, entitles a student to a refund of tuition according to the schedule listed below. No other fees are refundable.

A student may receive a 100 per cent refund, if withdrawal is during the first calendar week in which classes begin. Otherwise, refunds will be made as follows:

Second week - 80 percent refund

Fifth week - 20 percent refund

Third week - 60 percent refund

After fifth week - no refund

Fourth week - 40 percent refund

Financial Aid

Rush University administers its financial aid program without regard to sex, race, color, religion, creed, or country of national origin, and is committed to a program of equal opportunity.

Graduate Students of the Graduate School

Purpose. The purpose of the financial aid program for graduate students at Rush University is to attempt to provide sufficient assistance to students to allow them to attend at the graduate level. Such assistance will generally be based upon the financial need of the student, though academic factors will be closely weighed. In addition to providing funds, certain types of assistance are intended to provide meaningful experience for the student as well as service to the institution.

Application Procedure

1. Submit a Rush University application for financial aid to the Office of the Dean of the College of Health Sciences. It will thereafter be forwarded to the Rush University Office of Student Financial Aid.

2. Submit a Graduate and Professional School Financial Aid Service statement (GAPSFAS). The Rush University code number to be used is 3263 for students in the College of Health Sciences.

3. At the option of the student, submit an application for an Illinois Guaranteed Loan. This program takes on increasing significance when federal and other programs are being funded at low levels. In this regard, the student may wish to seek counseling from the Financial Aid Office at an early date.

Application Deadline. For the student to receive the most favorable consideration for aid from Rush University, the applications should be on file by May 1st preceding the student's fall enrollment. Late applications will be considered on a rolling basis if funds remain after the distribution to on-time applicants. Students admitted after May 1st or for enrollment other than at the beginning of the Fall term, and who have not completed the application process will be given a reasonable time to do so.

Renewability of Financial Aid. A student's financial aid will generally be renewed each quarter, if funds permit, and if the student remains in good academic standing and continues to have financial need.

Counseling Services. The Office of Student Financial Aid is available on a daily basis to assist students with financial planning and resource availability. Students are welcomed and encouraged to make use of these services.

Scholarships/Grants

The above-outlined application procedure for College of Health Sciences, Graduate School students will give the student consideration for programs described below in alphabetical order.

Broda O. Barnes Fellowship. A fellowship has been established for a deserving and meritorious student enrolled in the doctoral program of the Division of Physiology, to be awarded by the Chairman, Department of Physiology.

Broda O. Barnes Fellowship in Memory of Anton J. Carlson and Arno B. Luckhardt. A fellowship has been established for a deserving and meritorious graduate student in the College of Health Sciences, to be awarded by the Dean of the College of Health Sciences.

Faculty Wives Scholarship. A scholarship fund for Rush University students has been established by a generous contribution from the wives of the faculty. These scholarships will be awarded on the basis of academic potential and financial need.

Graduate Assistantships. These represent funds generally obtained through grants to individual faculty and, as such, vary in amount from Division to Division, although they generally are uniform within a Division.

Graduate Traineeships. Certain Divisional programs with NSF training grants or NIH National Research Service Awards may from time to time have positions to be filled on such grants. In addition, graduate students may directly apply to NSF or NIH for such support. All such individuals will be classed as graduate trainees.

Rush University Scholarships. A limited number of scholarships generally become available each year through contributions from private donors.

Senior Graduate Assistantships. Upon admission to candidacy, and subject to availability of funds within Divisions, graduate students may apply for these awards. Generally the intent is to supplement the stipend levels of graduate students showing unusual responsibility, promise, and ability beyond the levels provided for by the research assistantships.

Teaching Assistantships. These represent funds available to support graduate students in return for teaching services rendered to specific Departments.

University Fellowships. These represent funds available to students through the College of Health Sciences. Amounts will depend on financial need and availability of funds. There will be no variation in the amount of the award between Divisions.

Loans

Illinois Guaranteed Loan Program. A loan program in which students make application directly to participating lending institutions (banks, savings and loan associations, credit unions, etc.), the State of Illinois acting as guarantee agent for the funds. Eligibility for the principal of the loan is generally determined by the lending institution, and loan proceeds are disbursed by the lending institution through the Financial Aid Office. Often, interest on the loan is paid for the student by the government while the student is in school, the Financial Aid

Office determining the student's eligibility for the interest benefits. Applications are available at the lending institutions; a small supply is also allotted to the Financial Aid Office for distribution.

National Direct Student Loan Program. A campus-based federally funded loan program, wherein funds are awarded by the Financial Aid Office to students on the basis of financial need. The principal repayment and interest charges are deferred until nine months after the student ceases attendance. Interest is at the simply compounded rate of 3 percent per annum. The loan fund under this program is a revolving fund, providing for loan repayments to become future loan funds for other needy students.

Employment

College Work-Study Program. A federal student employment program wherein students work part-time to help meet the costs of attendance. Employment under this program is approved by the Office of Financial Aid and is based upon the financial need of the applicant.

Institutional Employment. Some opportunities exist for the student to work part-time within the institution. The student should be mindful, however, that the academic workload will severely restrict and occasionally preclude one from working during the academic term.



Divisional Programs

(Programs in addition to those described are in process of active development)

Biochemistry	73
Immunology	84
Physiology	92



Graduate Division of Biochemistry

Howard H. Skyeck, Ph.D., Director

Faculty

Bezkorovainy, A.	Dubin, A.	Kachmar, J.	Morley, C.
Booyse, F.	Harrison, W.	Kuettner, K.	Rafelson, M.
Cohen, M.	Hayashi, J.	Lobstein, O.	Sky-Peck, H.
Cole, E.	Hof, H.	Mattenheimer, H.	Weinstock, A.

Introduction

The Graduate Division of Biochemistry provides a graduate training program with excellent facilities for students pursuing work toward the Doctor of Philosophy Degree.

The objective of this program is to provide education in and opportunity for modern biochemical research. While the orientation is not primarily clinical, location in a large, active medical center provides an ideal environment for fundamental biochemical studies at all biological and medical levels.

All academic affairs for graduate students in Biochemistry are directed by the Graduate Program Director and the Graduate Advisory Committee. The Graduate Advisory Committee, chaired by the Program Director, consists of six members of professorial rank, who are active members of the Graduate Faculty in the Biochemistry Division. It approves students' advisory, theses, and examination committees, programs of study, advises on advancement to candidacy for the Ph.D. Degree, considers petitions, leaves, readmissions, probations, etc. In general, the Graduate Advisory Committee is charged with the following:

1. To recommend to the Director of the program acceptance or nonacceptance of graduate student applications for admission. In so doing, the committee considers the general admission standards set by the Graduate School and its own Division standards. Following such review, the Director of the program will recommend to the Dean and the Executive Committee of the Graduate School action to be taken concerning admission of the applicant.
2. To review the progress and status of all graduate students in the program periodically (e.g., annually) and to notify the Director and the Major Advisor and/or Thesis Advisor of any actions needed to promote the best interests of the students and/or the Division.
3. To adjudicate difficulties arising between students and Advisor either directly or by referring these to other committees and/or to the Director.
4. To review and approve course outlines for new graduate course proposals and to submit approved new graduate courses to the Executive Committee of the Graduate School.
5. To recommend the dropping of students from the Graduate Program for cause.
6. To coordinate various graduate educational activities as necessary.
7. To recommend appointees to examining committees.
8. To submit to the Program Director informal, timely reports concerning graduate affairs in the Division.

Members of the Graduate Advisory Committee are elected to serve three-year terms by the active Graduate Faculty of the Division.

It is the student's responsibility to read and observe the regulations set forth by the Division, Graduate School and Rush University. It is also the responsibility of each student to read and observe the requirements for advanced degrees set forth by the Division, and to meet deadlines established herein or by the Graduate School. Failure to receive notice for examinations, filing dates, etc., does not exempt students from requirements. It is the student's duty to seek out this information.

Admission to Graduate Programs in Biochemistry

In addition to the general requirements for admission established by the Graduate School, the Division requires a minimum grade point average (GPA) of 3.0 out of 4.0 maximum. In addition, the prerequisites described below form the basis for evaluation of applicants. On occasions, exceptions may be made to some prerequisites when outstanding creativity or potential is evident.

Prerequisites For Ph.D. Applicants

Courses: The Division encourages applications from all areas of science, but expects successful applicants to have or acquire a background comparable to the requirements for the Bachelor's Degree in Biology or Chemistry. Admission with deficiencies in preparation may be granted in exceptional cases. An extensive background in

Chemistry, Physics or Mathematics is desirable. Undergraduate training should include 24 semester hours of Chemistry, including Organic, Quantitative Analysis, and Physical Chemistry; 8 semester hours of Physics, including laboratory work in electricity, heat, mechanics, and sound; and at least one thorough two-semester course in Biology. If an applicant's undergraduate preparation is deficient, certain of these courses may be pursued without graduate credit after admission to the program. Deficiencies in these or other subjects must be made up at the earliest opportunity. Undergraduates who are prospective applicants should review their preparation for graduate school with this in mind.

Languages: No foreign language is required for admission to the Ph.D. program.

Graduate Record Examination (GRE): All applicants are required to take the Aptitude Test (Verbal and Quantitative) of the Graduate Record Examination. Although no minimum score is required for admission, most successful applicants or students obtain a total raw score of 1100 or more in these two areas. The Advanced Test in Biology is not required for admission, but applicants may find it useful in evaluating their own achievement in comparison with other applicants to graduate schools.

Letters of Recommendation: Three letters of recommendation are required. These should be from professors, supervisors, or others who may provide an evaluation of accomplishments or potential in research, scholarly activities, teaching and related academic functions.

Advisors: Upon admission, one or more Graduate School professors will be assigned to serve as Program Advisor for the applicant. The Program Advisor may be Provisional or Permanent Major Advisor depending upon mutual consent between the student and the faculty member. Thus applicants are urged to correspond personally with the various professors in the Biochemistry Program to discuss their academic interests. Applicants are also encouraged to seek an interview with professors whenever possible. Every graduate student in degree status must have a Program Advisor (or Major Advisor) assigned from within the Graduate Program in Biochemistry. This Advisor, who must be an active member of the graduate Faculty, has the primary duty to assist the student in planning and carrying through a program of graduate study which satisfies the Program and Graduate School requirements. The Major Advisor serves as Supervisor of the student's research project.

Where and When to Apply

Where: Inquiries should be directed to:

Graduate School Admissions Office
600 South Paulina Street
Chicago, Illinois 60612

When: Inquiries are answered at any time, but applications for admission should ordinarily be completed three months prior to the anticipated date of admission to the Graduate Division Program.

Evaluation of Completed Applications

Routing of Applications: After reviewing the application the Graduate Advisory Committee will send the application to the various sub-program Directors (such as the Clinical Biochemistry Program), or to those professors most likely to be interested in the applicant.

Evaluation by Professors: An applicant is recommended for admission or rejection by the professors. A professor recommending admission thereby agrees to serve as Program Advisor if assigned as such by the Graduate Advisory Committee. Once a "yes" is obtained, a recommendation to admit the student is immediately sent by the Graduate Advisory Committee to the Graduate School Executive Committee for final approval. Rejected applications are returned to the Graduate School Office.

Division Requirements for a Ph.D. in Biochemistry

Normal Progress: All Ph.D. students are expected to make "normal progress" toward fulfillment of program requirements. Failure to maintain an average G.P.A. of 3.0, failure on Oral and/or Written Qualifying Examination, or failure to complete the dissertation within four years from date of admission, result in probationary status. Students on probation may be ineligible for Teaching Assistantships or other financial support. Students who are Teaching Assistants may retain their assistantships for one additional quarter while on probation for violation of the G.P.A. requirement.

Upon recommendation of the Graduate Advisory Committee, with the approval of the Graduate Advisor and the student's Guidance Committee, the Graduate School Executive Committee and the Dean may dismiss any probationary student who does not rectify his/her probationary status.

Grades: Students who have an "incomplete" grade will have one quarter in which to complete the work to remove the "incomplete" grade; otherwise, the "incomplete" grade will be changed to "failure" at the end of the first quarter following receipt of the "incomplete" grade. Continuous research courses (598) are graded Pass or Fail and do not contribute to the G.P.A.

Program Advisor and Major Advisor: The Graduate Advisory Committee assigns a Program Advisor upon admission to the Program. Assignment is by mutual consent of student and professor. The Program Advisor serves as Chairman of the Guidance Committee, consisting of two other graduate faculty members, which first meets with the student during registration week to develop a program of study. Service as a Program Advisor does not commit the professor to supervise the dissertation, nor does it commit the student to the professor. Changes in Program Advisor are made by mutual consent and approval of the Graduate Advisory Committee.

Normally, a Program Advisor serves until the student successfully completes the Qualifying Examinations, whereupon the student must find a Major Advisor within one quarter. The Program Advisor may also serve as Major Advisor to the student by mutual consent and approval of the Graduate Advisory Committee. The Major Advisor, who serves as Research Advisor and Thesis Advisor, is selected by the Graduate Advisory Committee for possessing appropriate professional maturity and experience in teaching, research, and other educational activities. Various factors influence student-Advisor assignment: Mutuality of research interests, availability, or unavailability of a faculty member by virtue of his or her other obligations, anticipated compatibility of student and Advisor, and student preferences. Final responsibility for the assignment of a student to an Advisor rests with the Program Director. Neither Advisor or student may abrogate the assignment without appropriate approval.

The Guidance Committee: A Guidance Committee, consisting of the Program Advisor or Major Advisor and two other Faculty Members acceptable to the student, will be appointed by the Graduate Advisory Committee. The Guidance Committee advises and guides the student until successful completion of the Qualifying Examinations, when it is automatically disbanded. The committee meets with the student from time to time to review accomplishments and determine if normal progress has been accomplished. Lack of normal progress is reported to the Graduate Advisory Committee for appropriate action. Service on a Guidance Committee does not commit a member to service on the Doctoral Committee. However, the Guidance Committee may be reconstituted as part of the Doctoral Committee following successful completion of the Qualifying Examinations.

The Doctoral Committee: Upon successful completion of the Qualifying Examinations, the student must obtain a Major Advisor to chair the Doctoral Committee. The committee consists of three members of the Graduate Biochemistry Faculty and two members of the active Graduate Faculty from outside the division and outside the student's major field or may include one member from an extramural institution with recognized excellence in graduate research and teaching in accordance with any provisions by the Graduate School Executive Committee. The Doctoral Committee is nominated by the Major Advisor after consulting with the student and prospective committee members, approved by the Graduate Advisory Committee and appointed by the Graduate School Executive Committee. Failure to find a Major Advisor places a student in probationary status. The Division, however, has the obligation to find research supervision for all of the doctoral students admitted to candidacy. A strong policy in this regard is that no student be "qualified" to proceed with doctoral work unless he is accepted as a Thesis Advisee by a member of the program. The Doctoral Committee conducts the Oral Qualifying Examination and guides the student in preparation and defense of the dissertation. After the Qualifying Examination has been passed and a dissertation topic approved, the Doctoral Committee shall also be known as the dissertation committee. The Dean of the Graduate School is *ex officio* a member of all dissertation committees. The dissertation and its defense or the final oral upon it must have the approval of at least four of the five members of the dissertation committee.

Courses, Languages, and Grades: There is no formal foreign language requirement for the Ph.D. Degree; however, individual professors and/or Doctoral Committees may recommend to the Program Director proficiency in foreign languages or other courses, and prescribe how the requirements are to be met. Each quarter in which a degree candidate student uses University facilities he must register in the appropriate graduate level course(s), or other courses recommended by the Guidance Committee.

1. After satisfactory completion of 48 quarter hours of graduate study and successful completion of the Qualifying Examination, students are eligible formally to pursue a program toward the Ph.D. degree. Before registration of the student for work toward the degree, the Doctoral Committee will outline a program of formal courses, seminars, and other requirements in an integrated whole relevant to the objectives of the student and his Major Advisor. The program as outlined shall be recorded in the Graduate School Office and may be altered at the discretion of the Graduate Advisory Committee, dependent upon the needs of the student.



A student may be granted candidacy for the Ph.D. degree only after successfully completing the Qualifying Examinations. The committee described above will prepare a program proposal for the Ph.D. degree with the student. This should be submitted to the Graduate School Office prior to registration for the first quarter following completion of the Qualifying Examinations, if possible, and must be submitted before registration for the second quarter after the examination.

2. Study Program - Minimum Requirements for the Ph.D. Degree

A. Formal Courses of Graduate Credit (500 and 600 Level).

In Major Discipline	36 Qtr. Hrs.
In Collateral Areas (Outside the Major)	12 Qtr. Hrs.
Research, Seminars and Electives	96 Qtr. Hrs.
TOTAL	144 Qtr. Hrs.

The Advisory Committee may also require additional courses.

B. Pass a Written Qualifying Examination and an Oral Qualifying Examination.

C. An acceptable dissertation.

Students are encouraged to spend time during the summer on research or course work. All course work and Qualifying Examination requirements for the Ph.D. Degree should be satisfied within two and one-half academic years after admission to the program.

The Ph.D. program is established on the assumption that a well-qualified student normally can complete it in four years of full-time work. If the student pursues part-time graduate study, or if the field of his graduate work is not the field of his undergraduate major, more time will be required. The student is required to complete his degree within six calendar years of the date upon which he begins graduate work in this program. Only in extraordinary cases may the time for completion be extended.

Ordinarily a student should not register for more than a total of 60 quarter hours of formal course work. Where the Graduate Program requirements make it mandatory for the student to pursue 24 quarter hours or more of undergraduate series courses as prerequisites for more advanced work, any credit earned in excess of 24 hours in an upper division course series in basic science courses may be counted toward graduate series courses up to a maximum of six quarter hours, provided the excess credit is in an area outside the major discipline.

Students may be required by their Guidance or Doctoral Committee to take courses in Advanced Organic Chemistry, Physical Chemistry, Qualitative Organic Analysis, or other advanced courses relative to their academic program, which may have to be taken outside Rush University. The specific courses must be approved by the student's Program or Major Advisor. Graduate electives may be taken within any graduate division of Rush Graduate School or at other accredited graduate institutions upon approval of the Major Advisor and the Graduate Advisory Committee.

Transfer Students with Master of Science Degree: Upon the recommendation of the Director of the Program of Biochemistry and with the approval of the Dean and the Executive Committee of the Graduate School admission with advanced standing is granted to applicants who have completed a Master's Degree or the equivalent elsewhere and who desire to become candidates for a doctorate at Rush University. If the applicant is admitted, one year of advanced study completed elsewhere is accepted as one year of residence, and the amount of credit to be accumulated at Rush University shall be determined by the Graduate Advisory Committee. All graduate work taken elsewhere is subject to evaluation by the Graduate Advisory Committee. In any case, no more than the minimum number of hours (48) required for the M.S. Degree may be applied toward the doctorate.

Qualifying Examination: The examination qualifying a student for candidacy is comprehensive in nature, partly written and partly oral, and designed, at least in part, to test the student's fitness to undertake independent research. Prior to taking the Qualifying Examination, the student must have met the Division requirements for doing so and have the recommendation of his Guidance Committee. Students should take the Qualifying Examination as soon as permissible.

When the student and his Guidance Committee have determined that he should take the Qualifying Examination, the student should seek permission to take the Qualifying Examination from the Program Director no later than 60 days before the date of the examination. The examination must be taken during the quarter in which permission is granted. The Qualifying Examination may be scheduled by the Division at any time during the quarter, provided that all members of the Advisory Committee are available to administer it. All portions of

the examination must be completed within one month. Postponement of the examination after permission has been granted must have the approval of the Program Director and the Graduate Advisory Committee.

The Written Examination will be prepared and read by the Graduate Advisory Committee. If the Written Examination is satisfactory, the student will be given an Oral Examination. If on the Written Examination the judgment of the committee is such that an Oral Examination cannot counterbalance a poor performance, then the committee is not obliged to give an Oral Examination, and the report to the Graduate School will be one of failure. In the case where the Written Examination is marginal, the committee may use the Oral Examination as an opportunity to confirm or alter its judgment of the student's performance.

When the student's Written Examination is satisfactory, then he must be given an Oral Examination covering in depth topics discussed in the Written Examination or touching upon additional material. The fact that a student has done well on the Written Examination is not to be construed to mean that the Oral Examination is to be a *pro forma* exercise. The Oral Examination is a serious and integral part of the qualifying procedure. During the Oral Examination, all members of the Doctoral Committee must be present and must render a judgment on the student's Qualifying Examination.

In the event the Qualifying Examination is failed, the Advisory Committee, at its discretion, may permit the student to take it once more at a time mutually satisfactory and within a period of not less than six months nor more than one year from the date of the first examination. A student may not be permitted to take the Qualifying Examination more than twice.

A student must pass both the Written and Oral Examinations in order to be judged to have passed the examination. The examination may not be reported as being passed if there is more than one dissenting vote.

Any student who has not been recommended for advancement to candidacy because of failure to meet these requirements, may be terminated unless he is given permission by the Graduate School Executive Committee upon the recommendation of the Graduate Advisory Committee to complete a thesis and terminate his graduate work with the M.S. degree.

Doctoral Dissertation: An acceptable dissertation based on original investigation is required. The dissertation must show technical mastery of a special field, capacity for independent research, and scholarly ability. The Doctoral Committee guides and reviews the research and writing. Final approval in the Division is accomplished when the committee approves the written form and is satisfied with the oral defense. The final public defense of the dissertation is based primarily on the graduate research and in the field of knowledge that constitutes the student's major subject. Final acceptance of the dissertation is given by the Dean of the Graduate School.

The student is expected to be registered in BIOCH 699 each quarter, excepting summer sessions, after admission to candidacy, until degree requirements are completed. Registration for the dissertation, in the three quarters excluding summer session, following admission to candidacy, is the minimum requirement entitling the candidate to dissertation supervision by his Doctoral Committee. If the dissertation is not completed and accepted within three quarters, the candidate must register for 699 each quarter thereafter until the dissertation has been accepted.

After meeting all other requirements, the candidate must defend his dissertation. This defense will be conducted in such a manner as to determine to the satisfaction of the candidate's Doctoral Committee whether he/she has attained the stage of scholarly advancement and power of investigation demanded by the University for final recommendation to the doctorate.

Requirements for the Ph.D. Degree in Biochemistry with a Major in Clinical Biochemistry

The purpose of the Ph.D. Degree Program with a Major in Clinical Biochemistry is to improve and to extend training and research on the clinical implications and applications of Biochemistry. Training is intended to heighten effective dialogue with clinical colleagues, to provide training and experience in the operation of a hospital laboratory, and to develop an appreciation for innovative approaches to problems of laboratory diagnosis.

It is not easy to define clinical biochemistry or to describe the activities of clinical biochemists. Here the term is used to describe the individual who is first and foremost a well-grounded biochemist, with interests related to problems of human biochemistry and disease, who tends to be a capable, analytic chemist, and who has interest in, and capacity for, continuing dialogue, teaching and learning at the interface between basic biochemistry and clinical application.

This program has the same requirements as the regular Graduate Program as to entrance, electives, examinations, etc., and differs only in the electives selected. The graduate courses available for electives in Biochemistry are listed below.

Graduate students admitted under this program will choose Research Advisors whose interests and facilities have a discernible relationship to Clinical Biochemistry. Electives will be selected in order to provide the best possible background for Clinical Biochemistry.

It should be evident that students in this program will be as competent and well-rounded biochemists as any other graduate students in the program and will not be distinguishable save for their electives and perhaps the nature of the research problem they undertake. A possible program for such students is listed below.

The Ph.D. Degree is a Research Degree, and will be conferred in recognition of proficiency in research, breadth and soundness of scholarship, and thorough acquaintance with a specific field of knowledge as determined by the Graduate Faculty.

Program of Study and Research: The education of a Clinical Biochemist at the Doctoral level prepares him/her to function effectively in research, education, service, and administration. These are the responsibilities of a Director of a Clinical Chemistry Laboratory. Training includes advanced lectures, seminars, attendance at hospital rounds, experience in the scientific operation of a Clinical Chemistry Laboratory, as well as in its management (preparation of budgets, ordering of capital equipment, purchasing, personnel relations, etc.).

The student will be exposed to intimate contact with hospital, house, and attending staffs and will participate in lectures and seminars in Clinical Biochemistry with the hospital staff.

Only minimal guidelines can be established for education of Clinical Biochemists at the Doctoral level. However, to achieve the program objectives, the student is expected to become capable of fulfilling the following functions:

Medical Function - The Clinical Biochemist must serve effectively as a (chemical) consultant to physicians in the area of analytical and physiological inference in reported values and in the relationship of biochemical findings to disease.

Analytical Chemical Functions - The Clinical Biochemist must be thoroughly grounded in theory, operation, and maintenance of all instrumentation and methodology applicable to the modern Clinical Chemistry Laboratory.

Research Functions - The Clinical Biochemist must be able to conduct original research. The student must satisfactorily complete a research problem of an original nature appropriate to the analytical phase of clinical and (or) a disease-related metabolic area.

Administrative Functions - The Clinical Biochemist must function as an administrator and have a working knowledge of the ethics of medicine and science.

Educational Functions - The Clinical Biochemist must be able to train technologists working in his or her laboratory and those who wish to enter the field of Clinical Chemistry.

Exceptions and Changes to Requirements

Requests for exceptions and changes to the above requirements for any graduate student must be submitted for evaluation to the Graduate Advisory Committee in writing, accompanied by signature of approval of the Advisor. In general, such requests will not be approved except when unforeseen contingencies such as illness, military service, maternity, or extenuating cases of hardship are evident.

In no case will exceptions be granted that lower the standards in fact or intent as prescribed by the Graduate Division.

Graduate Division Faculty Research Areas

Bezkorovainy, Anatoly, Ph.D., Professor: The study of human milk and colostrum glycoprotein, the isolation and characterizations of transferrin receptor from reticulocytes, and the limit cleavage and isolation of a single iron-binding site of lactoferrin.

Booyse, Francois M., Ph.D., Associate Professor: Studies on the mechanism and regulation of blood platelet interactions and platelet-vessel wall interactions in order to better understand the physiological role of platelets and vessel wall endothelial cells in maintaining normal hemostasis.

Cohen, Maynard M., M.D., Ph.D., Professor, Jean Scheppele Armour Chair of Neurology: An integrated program to study the molecular and electrical phenomena of the nervous system and subcellular structure of nerve cells to the function of the brain as a whole, in health and disease, is currently under investigation. These studies include the effects of new vasoactive drugs on survival of ischemic animals; the mechanisms of action of

catecholamines which are produced in the nervous system and function as impulse transmitters and hormones; the effects of exogenous toxins such as lead, arsenic, and mercury on cerebral biochemical systems of carbohydrate and amino acid metabolism.

Cole, Edmond R., Ph.D., Associate Professor: The fibrinolytic mechanism is a major defense system, which prevents permanent occlusion of blood vessels. A plasminogen activator from tissues has been isolated in high purity to study its physicochemical properties. Elucidation of the mechanism of activation of this process is proceeding with the objective of developing drugs to effect release.

Dubin, Alvin, M.S., Associate Professor: The study of branched-chain and aromatic amino acid metabolism in hepatic coma. The drop in concentration of branched-chain amino acids in liver leads to a series of metabolic events resulting in coma and death. Attempts are being made to elucidate the mechanism and reverse the process.

Harrison, William, Ph.D., Professor: The catecholamines function in the nervous system as nerve impulse transmitters or hormones. Hexokinase, a key enzyme in carbohydrate metabolism has been found to be stimulated by the catecholamines. The relationship of the hexokinase stimulation effect to the overall function of the catecholamines is being studied.

Hayashi, James A., Ph.D., Professor: Immunization of monkeys with extracellular extracts of *Streptococcus sanguis*-20 has resulted in a decrease in dental caries by 60 per cent over control cariogenic monkeys. The sera from immunized monkeys exhibited an inhibitory effect on the bacterial enzyme neuraminidase. Absorption of the monkey sera with human IgM antiserum reduced the inhibitory activity significantly, whereas anti-IgC and anti-IgA had no effects.

Hof, Hildegard I., Ph.D., Assistant Professor: A study to determine the distribution of concanavalin-A binding carbohydrate chains in total brain glycoproteins is being completed. Purification, separation, and classification of glycopeptides derived from brain glycoproteins and lectins are being studied. Demonstrated that 25 per cent of brain glycopeptides bind lactin and concanavalin-A. Studies of 3-methoxy-4-hydroxyphenyl glycol excretion in brain dysfunction and alcoholism are being undertaken in patients.

Kachmar, John F., Ph.D., Associate Professor: A study of the gamma-glutamyl transferase enzyme system with emphasis on finding a more effective glutamyl-acceptor than glycine with a more soluble chromogenic substrate. There is some evidence that tissues respond to pharmaceutic agents by a rise in gamma-glutamyl transferase. Studies on these reactions are in progress.

Kuettner, Klaus E., Ph.D., Professor: The molecular organization and metabolism of extracellular cartilage and its relationships to cells. Studies included the changes that occur during differentiation of epiphyseal cartilage, calcification and replacement by bone and the mechanisms which regulate bone formation and calcification. A main emphasis has been the molecular arrangement of proteoglycans, which in a very specific aggregated state show involvement in the inhibition of calcification.

Lobstein, Otto E., Ph.D., Associate Professor: Research studies into the isoenzymes and their activities of amylase, alkaline phosphatase and lysozyme of pancreas and pancreatitis versus extrapancreatic diseases with the objective of establishing a more definitive method of differentiation.

Mattenheimer, Hermann G. W., M.D., Professor: Twelve different enzymes have been investigated in the respiratory tract of Syrian golden hamsters following cigarette smoke inhalation. The activity of adenyl kinase is inhibited after one exposure to smoke. The inhibition of this enzyme may be a link to the ciliotoxicity of cigarette smoke. A new immunological test has been developed which permits differentiation of CPK isoenzymes. This kinetic test distinguishes between the M-subfraction of CPK-MM (Skeletal Muscle) and CPK-MB (Heart). The new test is now being evaluated in patients with myocardial infarction.

Morley, Colin G. D., Ph.D., Assistant Professor: The biochemical control of liver cell growth. This study includes the humoral and hormonal factors such as insulin, growth hormone, glucagon, and thyroid hormone which appear to be capable of altering DNA synthesis in hepatocytes and may be involved in the regulation of liver cell growth. Present studies have identified a heat-stable, nondialyzable polypeptide (RF₁) found in serum of rats following partial hepatectomy which is specific for stimulation of DNA synthesis in hepatocytes.

Rafelson, Max E., Ph.D., Professor: The response of endothelial cells and platelets to nicotine and extracts from standardized cigarette smoke condensates is being studied. The overall goals of this program are to identify and define the effects of nicotine and standardized extracts of smoke on 1) specific growth, biochemical and functional properties of arterial endothelial cells in culture, and 2) specific biochemical and functional properties of platelets *in vivo* and *in vitro*.

Sky-Peck, Howard H., Ph.D., Professor, John W. and Helen H. Watzek Chair of Biochemistry: Studies continue on the changes induced by various forms of chemotherapy on the incorporation of thymidine into human tumor DNA. The effects of various forms of therapy on various phases of the cell cycle are being investigated by the use of double pulse labeling. The major objective is to study the presence or absence of specific nuclear receptor activators in normal and neoplastic nuclei which regulate the synthesis of DNA. Various phases of the cell cycle are being studied for their specific functions.

Weinstock, Albert, Ph.D., Assistant Professor: The physical and chemical characteristics of heart mitochondrial creatine phosphokinase (CPK) isoenzymes is under investigation in this laboratory. The primary objective is to isolate mitochondrial CPK and study unique kinetic rates and stability characteristics applicable to the development of methodology for quantitating myocardial infarct size and for assessing therapy designed to protect ischemic myocardium.



Sample Graduate Course Schedule Leading to a Doctorate Degree in Biochemistry with a Major in Clinical Biochemistry

First Year

Fall		Winter		Spring		Summer
BIOCH 501	5	BIOCH 502	5	BIOCH 503	5	BIOCH 598
BIOCH 595	1	BIOCH 595	1	BIOCH 595	1	Electives
CHEMISTRY I	3	CHEMISTRY II	3	CHEMISTRY III	3	
ELECTIVES	3	ELECTIVES	3	ELECTIVES	3	
	12		12		12	

Second Year

BIOCH 611	4	BIOCH 612	4	BIOCH 622	2	BIOCH 598
BIOCH 616	3	BIOCH 614	3	BIOCH 690	1	Electives
BIOCH 623	1	BIOCH 623	1	BIOCH 621	2	
BIOCH 598	2	BIOCH 598	2	BIOCH 598	2	
ELECTIVES	2	ELECTIVES	2	ELECTIVES	2	
	12		12		12	

Third and Fourth Year

BIOCH 690	1	BIOCH 690	1	BIOCH 690	1	BIOCH 699
BIOCH 699	8	BIOCH 699	8	BIOCH 699	8	Electives
ELECTIVES	3	ELECTIVES	3	ELECTIVES	3	
	12		12		12	

This represents a generalization; in reality a graduate program will be tailored to meet the individual needs of each graduate student. Each program will be developed by the student in conjunction with his Guidance Committee and the approval of the Graduate Advisory Committee.

Sample Graduate Course Schedule Leading to a Doctorate Degree in Biochemistry

First Year

Fall		Winter		Spring		Summer
BIOCH 501	5	BIOCH 502	5	BIOCH 503	5	BIOCH 598
BIOCH 595	1	BIOCH 595	1	BIOCH 595	1	Electives
CHEMISTRY I	3	CHEMISTRY II	3	CHEMISTRY III	3	
ELECTIVES	3	ELECTIVES	3	ELECTIVES	3	
	12		12		12	

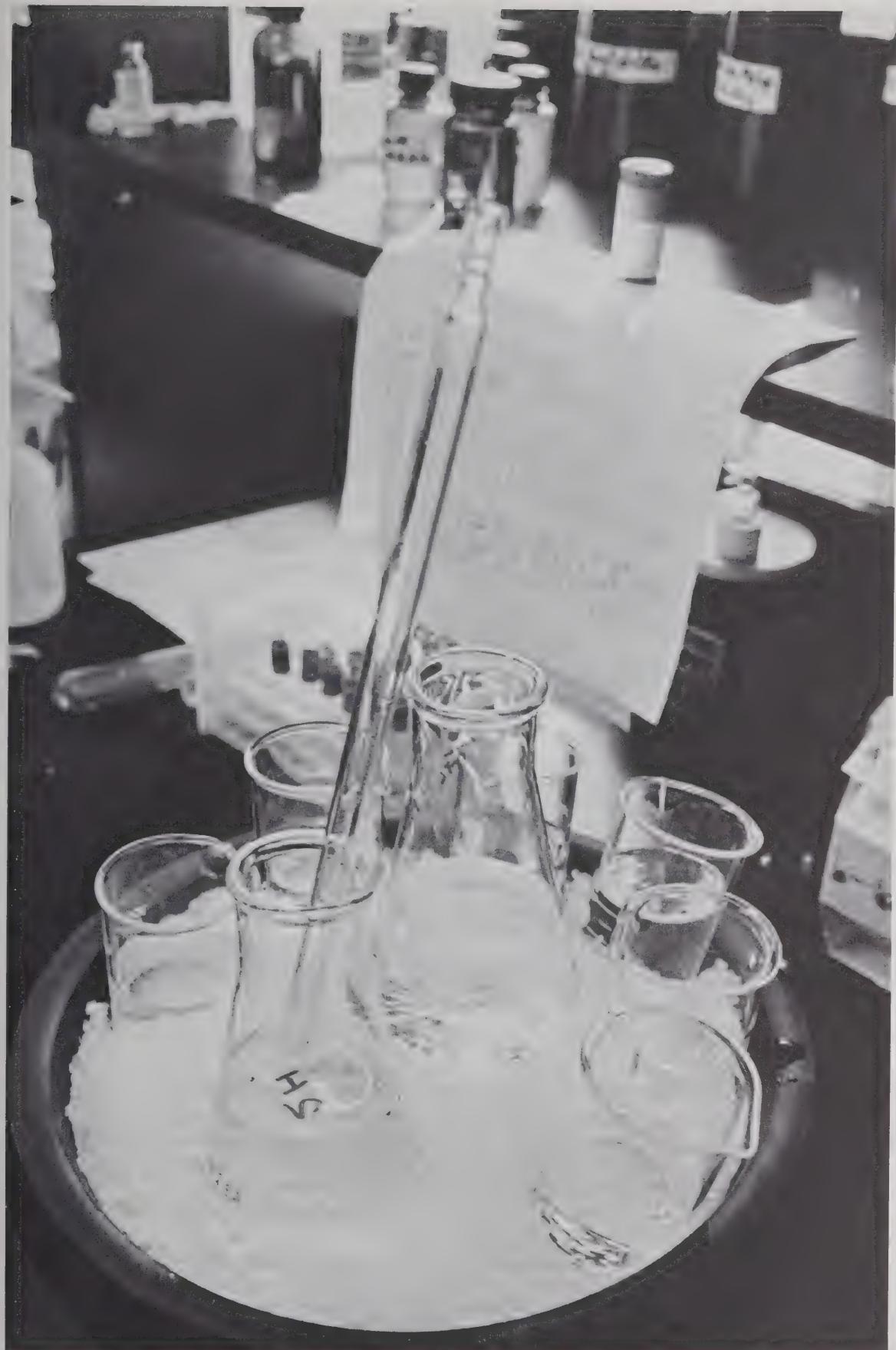
Second Year

BIOCH 581	4	BIOCH 595	1	BIOCH 595	1	
BIOCH 595	1	BIOCH 598	5	BIOCH 598	5	BIOCH 598
BIOCH 598	4	ELECTIVES	6	ELECTIVES	6	Electives
ELECTIVES	3					
	12		12		12	

Third and Fourth Year

BIOCH 595	1	BIOCH 595	1	BIOCH 591	1	BIOCH 699
BIOCH 699	8	BIOCH 699	8	BIOCH 699	8	Electives
ELECTIVES	3	ELECTIVES	3	ELECTIVES	3	
	12		12		12	

This represents a generalization; in reality a graduate program will be tailored to meet the individual needs of each graduate student. Each program will be developed by the student in conjunction with his Guidance Committee and the approval of the Graduate Advisory Committee.



Graduate Division of Immunology

Alexander P. Osmand, Ph.D., Director

Faculty

Fiedel, B.
Gewurz, H.

Jones, J.
Lint, T.

Osmand, A.

Program Outline

The Division of Immunology offers an interdepartmental program of research and training in Immunology leading to the degree of Doctor of Philosophy. The faculty of this program will be drawn predominantly from the departments of Immunology, Medicine, Microbiology and Pathology of Rush University. Areas of current interest in which research training is offered include: the immunobiology of the inflammatory response; immune interactions of cells and membranes; the biology of the complement system, including the control of the complement attack mechanisms and the pathophysiology of complement deficiencies; cellular immunology, particularly cell-mediated mechanisms in inflammation; the immunopathology of coagulation; the structure and function of the C-reactive proteins. The application of basic research to questions of human health and disease continues to be a general commitment of the faculty of this program.

Facilities

The participants in this program are drawn from a University faculty based in an active Medical Center dedicated both to patient care and to the support of clinical, biomedical and basic biological research. The contributing departments are well equipped with both teaching and laboratory facilities for research in Immunology.

Objectives

The objectives of this program are to provide an environment for each student to learn to the limits of his/her ability, and to train independent investigators able both to conduct original research in Immunology, and, as scientists and teachers, to effectively communicate and impart their knowledge.

The program is directed toward the Ph.D. degree. The degree will be awarded by the University upon the satisfactory completion of the academic program and the submission and presentation of a dissertation demonstrating the ability of the student to perform and present original scientific work. In addition, the student is required to pass an oral examination based on thesis research and related areas of science, and must satisfy the examiners that a broad conceptual understanding of the field of Immunology has been reached.

Application and Admission

Students who have recently received the baccalaureate, Masters or a doctoral degree may apply. Although not essential, it is recommended that students wishing to enter the Immunology program should have achieved high competence in biology, mathematics and chemistry. It is important that applicants must be adequately prepared to engage directly and independently in graduate study and research.

Although there is no deadline for applications, candidates for admission to the graduate program should address their enquiries not less than three months in advance of the date for which admission is sought to:

Graduate Admissions Office
600 South Paulina Street
Room 474M
Chicago, Illinois 60612

Applicants should send the following documents to the Graduate School Admissions Office:

1. Complete application forms from the Graduate School of the College of Health Sciences, Rush University.
2. Letters of recommendation from three or more sponsors, preferably faculty members of the student's current or recent college, who can assess the applicant's potential for independent graduate study and research. The sponsors should be made aware of the nature of the program for which entry is sought.
3. Official transcripts of all graduate and undergraduate studies undertaken by the applicant.
4. An outline of any relevant research or teaching experience.
5. A personal statement in which the applicant indicates his reasons for wanting to do graduate work in Immunology, and describes the relevance of his goals and academic training to this program. An indication of the specific areas of potential research interest, when such can be identified, would be valuable in directing the applicant to specific faculty members and advising him of the detailed activities and openings in that area.



Although not required, the Graduate Record Examination is strongly encouraged as an additional credential and the results of this should be submitted.

Applications for admission to the program will be evaluated initially by the Program Director and the Office of the Dean of the Graduate School. Additional information may be requested prior to forwarding the application to the Admissions Committee of the Immunology Division. Considerations by the Committee will include overall academic record, the recommendations of the sponsors and the description of the applicant's own aspirations and interests. Personal interviews may be requested of an applicant still under consideration after preliminary screening. Students will be admitted into the program at levels other than first year only under exceptional circumstances; this requires recognition by the Admissions Committee and acceptance by the Graduate School Executive Committee that graduate training already undertaken by the student elsewhere is of a suitable standard, and that the student has reached the required level of competence in the areas of relevance to his proposed investigation. Such students may be exempted from certain coursework and/or preliminary examinations. However, credit for research hours will not be allowed.

Program Leading to the Ph.D. Degree

Outline

A minimum of three years and a maximum of five years full-time (four quarters per year) study and research, or equivalent in time, is required to satisfy the residency requirements of this program. Although there is no prescribed sequence of courses, students are expected to study and learn to the limits of their ability and achieve an understanding of the four major areas of Immunology: Immunobiology, Immunochemistry, Immunogenetics and Immunopathology. Additional training is available to allow the students to develop a competence in Clinical Laboratory Immunology.

During the first 12 to 18 months the student will carry out an academic program, designed for his own requirements, through frequent and continuous discussion with the Graduate Advisory Committee of the Immunology Division, that should provide the student with a thorough grounding in Immunology and extensive practical experience in several laboratories of the division faculty. The selection of a Principal Advisor will usually be made within 12 months after admission. With the exception of prescribed seminars and tutorial courses, the student will devote himself full-time to thesis research following successful completion of courses and acceptance of his proposal within 18 months of entering the program. The research program will be carried out under the guidance of a designated Principal Advisor and a Thesis Committee. Following agreement by the student, advisor and Thesis Committee that a suitable stage in the research program has been reached, the student will prepare and present a dissertation demonstrating the ability to carry out a research program and perform an original contribution in the area of investigation. An additional examination of the student's understanding within the field of Immunology will also be made.

Course Requirements

Although there are no formal course requirements, independent study from prescribed reading lists and frequent discussion with faculty will be supplemented with lecture-tutorial courses of both a basic and advanced nature within the Division of Immunology. Other course requirements, as specified in the student's academic program, may be met by completion of lecture, tutorial or laboratory courses in other divisions of the Graduate School. Successful progress will be assessed by the instructors of such courses. It is anticipated that courses in some subjects considered essential for a particular student's academic program will not be available in the Graduate School. Such requirements may be met either by special arrangement with the faculty of other institutions, or by enrolling in, or auditing, such courses available at other institutions within the geographical area. Faculty assistance in the identification of these courses and supporting tutorial instruction will be arranged by the Program Director; in addition, performance may be assessed in the same manner as intramural courses.

In addition, students admitted to this program will be encouraged to attend lectures presented in the Phase I and Phase II Immunology courses for Rush Medical College. Involvement is required in the Department of Immunology Research Conferences, Journal Clubs and tutorial discussions, as may be specified from time to time by the Graduate Advisory Committee.

Assessment of Progress

The academic progress of each student will be continuously assessed by each faculty member with whom the student has worked. The use of conventional examinations or tests is not encouraged, although instructors are free to use whichever system of assessment they wish to apply.

The overall progress of a student is evaluated annually based on written reports from faculty members and a report from the student. The report should describe the status of the academic program, the progress of research and laboratory activities, and should identify projected requirements for the remainder of the program. Students will be graded in accordance with the regulations of the Graduate School, although, in addition to a transcript, a statement of progress may be compiled from the student and faculty reports and this will be submitted together with grades to demonstrate the student's successful progress.

It should be stressed that the purpose of such assessment and examination is primarily to aid the student in achieving academic goals by determining depth of understanding of the several areas of study, and, when necessary, identifying problems in order to enlist the aid of other faculty to assist the student in his or her training. Considerable importance in this continuous assessment is placed on the student's ability to communicate. Guided development of the skills required for both literary and verbal presentation of knowledge and ideas, as well as their formulation, is an important responsibility of the faculty in this program.

Graduate Advisory Committee

A committee consisting of at least three and preferably five faculty members, including the Program Director of the Division of Immunology, shall meet regularly with each student during the first 4 to 6 quarters residence. Initially the role of this committee is to assist the student in the design of an appropriate academic program; secondarily to ensure the continued satisfactory progress of the student and instigate any necessary changes or additions to this program; and finally to guide both the student and faculty in the selection of advisors and in the appointment of the Thesis Committee.

Thesis Committee and Thesis Proposal

It is expected that within 12 months of admission the student shall have identified an area of specialization and a Principal Advisor with whom to carry out his or her research activities. Prior to proceeding with the research program and within 18 months of admission the following requirements must be met and accepted by the Graduate Advisory Committee:

1. Successful completion of course work identified in the student's academic program.
2. Adequate performance in an oral and/or written preliminary examination.
3. Formation of a Thesis Committee which shall have at least three members: the Principal Advisor, the Program Director, and one other individual with recognized expertise in the candidate's field of interest, who is selected jointly by the candidate, Principal Advisor and Program Director. This individual should ordinarily be a faculty member of an institute of higher education, active in research in the area of investigation and should demonstrate willingness to maintain active contact with, and advise, the committee and student concerning the progress of research training for the duration of the candidacy. When additional advisors are required, these also shall be members of the Thesis Committee.
4. Acceptance by the Thesis Committee of a thesis proposal for the research program that should constitute a scholarly outline of work leading to a contribution to existing knowledge. The proposal should include an extensive review of the relevant literature, and a detailed outline of the proposed research demonstrating an understanding of the technical and theoretical aspects of the experimental protocols. The student may be required to defend this proposal before the Graduate Advisory Committee.

Thesis

Following admission to candidacy the student shall devote himself full-time to research activities under the guidance of the Principal Advisor and Thesis Committee, and shall actively involve himself in all the scholarly pursuits of the Division, including tutorials, seminars and Journal Clubs. Students are expected to seek out opportunities to gain experience in teaching, and where possible, maximal involvement in the teaching activities of the Division faculty, to the extent that this does not interfere with the progress of the research program, is actively encouraged.

Following at least six quarters of research activity and agreement by the student and his Thesis Committee that research progress is such that a dissertation may be prepared and presented, the Graduate Advisory Committee shall be notified. At least six months prior to the expected date of completion, a timetable will be set by the Graduate Advisory Committee (with the approval of the Thesis Committee) providing a deadline for submission of the thesis and times for presentation and defense of thesis. Additional examinations also may be required and a timetable will be established for these.

A Thesis Examination Committee will be appointed for each candidate by the Graduate Advisory Committee with the approval of the Graduate School Executive Committee and the Dean. The committee shall be composed of the Thesis Committee of the student and two or more members of the Faculty of the Graduate School one of whom should be familiar with the area of investigation of the thesis. In addition to their evaluation of the thesis the Examining Committee will request evaluation of the written dissertation by at least one scientist (external examiner) of international stature in the field of investigation who is not affiliated with Rush University.

Recommendation to the University for the award of the degree of Doctor of Philosophy is made on the basis of scholarly achievement and research ability. The role of the Thesis Examination Committee is to evaluate the student based on the following:

1. Annual progress reports by both student and faculty;
2. Presentation of the scientific basis of the dissertation in an open lecture;
3. Reports of the external examiner(s) concerning the standard of scholarly research presented in the dissertation;
4. An oral defense of thesis before the students and faculty of the Division; and
5. Successful performance in oral and/or written examinations to determine the student's overall competence in the field of Immunology.

The Thesis Examination Committee may request additional examination of the student or evaluation of the dissertation. Upon agreement that the student has satisfactorily met the requirements for the award of the degree, the recommendations of the Thesis Examination Committee will be forwarded to the Graduate Advisory Committee for communication to the Graduate School.

If, within 10 quarters of research activity the student has not submitted a dissertation or the Thesis Committee has failed to notify an intent to submit a dissertation, the Graduate Advisory Committee may assume the role of Thesis Committee to evaluate the progress of the student and suggest alterations that would enable candidacy requirements to be completed within one calendar year.

Course Offerings

A. The following courses will be available, subject to demand and to limitation, to first year graduate students within the Graduate School. Prerequisites are a general competence in chemistry and biology. Variable credit.

IMMUN 501

Fundamentals of Immunology: An introductory course of lectures and tutorials; an historical background in Immunology; the structure and development of the lymphoid system; antigen-antibody interactions; the biology of lymphocytes.

Prerequisites: Instructor approval

Staff - Fall quarter

IMMUN 502

Basic Immunochemistry: Structure of Immunoglobins; hapten-antibody reactions; the antibody combining site; complement; antibody heterogeneity.

Prerequisites: Instructor approval

Staff - Fall quarter

IMMUN 503

Principles of Cellular Immunology: T and B lymphocytes; cell cooperation in the immune response; lymphocyte receptors; tolerance.

Prerequisites: Instructor approval

Staff - Fall quarter

IMMUN 504

Biology of the Lymphocyte Membrane: Structure and composition of cell membranes; fluid-mosaic model; properties of the cytoskeleton; receptor redistribution; antigen receptors and cell recognition; histocompatibility antigens.

Prerequisites: Immunology 502, 503 or equivalent, Instructor approval

Staff - Winter quarter

IMMUN 505

Complement: Components of the classical pathway; alternative pathways; lysis of cell membranes; complement deficiencies; genetics of the complement system; regulation and control.

Prerequisites: Immunology 502 or equivalent, Instructor approval

Staff - Winter quarter

IMMUN 506

Phagocytosis and Host-Parasite Relationships: Mononuclear phagocytes; polymorphonuclear leukocytes; the nature of lysosomes; mechanisms of chemotaxis, phagocytosis and intracellular digestion; metabolic pathways in phagocytes; role of the phagocyte in disease.

Prerequisites: Instructor approval

Staff - Winter quarter

IMMUN 507

Ontogeny and Phylogeny of Immunity: Phylogeny of the lymphoid system; evolution of the immunoglobulins; immune mechanisms in invertebrates; ontogeny of the lymphoid system.

Prerequisites: Immunology 501, 502, 503; Instructor approval

Staff - Spring quarter

IMMUN 508

Introduction to Immunogenetics: Allotypes; blood group substances; histocompatibility antigens; immune response genes; the major histocompatibility complex; genetics of the H-2 and HLA systems.

Prerequisites: Immunology 501, 504; Instructor approval

Staff - Spring quarter

IMMUN 509

Tumor and Transplantation Immunology: A tutorial course, supplemented by extensive reading lists, introducing the immunology of malignancy and tumor biology; allograft rejection and graft vs host reactions; immune surveillance and alloaggression.

Prerequisites: Immunology 501, 503, 508 or equivalent; Instructor approval

Staff - Summer quarter

IMMUN 621

Cellular Immunology and Immunogenetics:

Staff - Fall and winter quarters, second year students

IMMUN 622

Medical Immunology:

Staff - Fall and winter quarters, second year students

IMMUN 623

Immunopathology:

Staff - Fall and winter quarters, second year students

D. The following courses, given by the Department of Microbiology in the College of Health Sciences are designed for graduate students, and may be selected for a student's academic program in addition to courses offered by other Divisions of the Graduate School.

MICRO 503

Animal Models of Human Disease: Natural and experimental diseases of animals are compared with similar diseases in man. Models of selected infectious, immunological, degenerative, metabolic and neoplastic diseases are presented as a lecture-seminar series with bibliographies provided for each model system.

Staff - Alternate years, by arrangement. 2 quarter hours

MICRO 502

Viral Oncology: This course offers a comprehensive review of biologic, immunologic, and molecular properties of animal and putative human oncogenic viruses. Techniques employed for investigating the role of viruses in neoplasia are reviewed.

Staff - Alternate years, by arrangement. 3 quarter hours

MICRO 501

Clinical Microbiology: Specimen collection, organism isolation and identification, and interpretation of serology are studied. Infections of various organ systems are covered as a lecture-seminar series and by assignment of pertinent readings.

Staff - Alternate years, by arrangement. 3 quarter hours

IMMUN 510:

Hypersensitivity and Immunological Mediators: A tutorial course describing the biochemical and cellular mechanisms of hypersensitivity reactions.

Prerequisites: Immunology 501, 503, 505 or equivalent; Instructor approval
Staff - Summer quarter

B. The following courses are specified as requirements for all graduate students in the Immunology program and run continuously through the year. Variable Credit.

IMMUN 581

Immunological Research Techniques and Instrumentation: A program of laboratory experience for first year students in several faculty laboratories, concurrently with lecture/discussion groups on theoretical aspects of laboratory methods. Introduction to the physical biochemistry of macromolecules; preparation of antigens and antibodies, and their detection; chromatography, electrophoresis, analytical and preparative ultracentrifugation; spectrophotometry and fluorimetry; light, fluorescence and electron microscopy; tissue culture methods; detection and enumeration of lymphocytes and antibody-forming cells. Demonstration of research instrumentation facilities.

IMMUN 590, 690

General Topics: Tutorial programs supplemented by general reading lists and paper presentation designed to maintain and develop a general understanding of Immunology.

Program director/Department of Immunology, Chairman; by rotation.

IMMUN 592, 692

Advanced Topics of Immunology: Tutorial programs supplemented by general reading lists, paper presentations and essays concerning the areas of Immunology specified by the instructor. This program is aimed at involving students in the specialties of the various faculty members, and at developing literary and critical skills in the expression and interpretation of scientific information.

Staff - by rotation

IMMUN 514, 614

Clinical Laboratory Immunology: A two-year program of practical and theoretical experience in all aspects of clinical laboratory immunology and immunodiagnosis.

IMMUN 699

Thesis Research:

C. Optional and advanced courses, subject both to demand and limitation, may be available during the second year, mainly tutorial. Variable credit.



Graduate Division of Physiology

Charles L. Schauf, Ph.D., Director

Faculty

Eisenberg, B.	Gottlieb, G.	Mathias, R.	Schauf, C.
Eisenberg, R.	Hegvany, C.	Michael, J.	Starr, M.
Gilai, A.	Levett, J.	Rovick, A.	

Introduction

The Graduate Division of Physiology of Rush University offers a program of largely independent study and research leading to the degree of Doctor of Philosophy. Advanced research training is offered in the fields of membrane structure and function; electrical properties of cells and tissues, including both peripheral nerve and muscle; synaptic physiology; neurophysiology, including aspects of visual processing and human motor control; cardiovascular physiology, including cerebrovascular control; and active transport processes. More detailed descriptions of the research activities of the Division may be requested from the Division Director.

Students who desire to specialize in this program are strongly advised to obtain a broad scientific foundation, including work in the related sciences. Courses in some or all of the following fields are suggested for attainment of this objective: physics, including electronics; chemistry, including physical chemistry; mathematics, including differential equations; molecular and cell biology.

Candidates for admission to the graduate program should address their inquiries at least three months in advance of the date for which admission is sought to:

Graduate Admissions Office
600 South Paulina Street
Room 474M
Chicago, Illinois 60612

An applicant who holds a degree from an accredited institution will be considered for admission on the basis of (1) an undergraduate record of superior quality demonstrating proficiency in quantitative science, (2) a well-organized plan for graduate study and research compatible with expertise in the Division, (3) recommendations from at least three college faculty members acquainted with the character and ability of the applicant to function in a program stressing an independent approach to the acquisition of knowledge, and (4) other materials as may be required by the Program Director. The Graduate Record Examination is recommended, but is not required. Except in unusual cases, the minimum prerequisites for admission will be the attainment by the applicant of a 3.0 overall average (4 point scale) in undergraduate studies with a 3.5 average in science courses preferably including the following: two years of physics or engineering; inorganic and organic chemistry; physical chemistry; advanced calculus; ordinary differential equations; cell biology or cell physiology.

The Program

Admission

Applicants for admission to the Division will be initially evaluated by the Director and Advisory Committee. Considerations will include overall academic record, evidence of previous ability to pursue successfully independent studies, recommendations of the applicant's undergraduate faculty, and the description of the applicant's scientific research interests. The Program Director will also determine whether additional supporting evidence would aid evaluation of the application and if so, make appropriate arrangements with the applicant.

Applications judged by the Program Director to demonstrate satisfactory credentials and interests compatible with the research facilities of the faculty will then be evaluated by all faculty members with expertise in the area(s) of interest of the applicant. Considerations in this phase will include not only academic ability, but also the resources available to support research in the indicated area. An interview may be requested. Ultimately, selection of applicants will be by invitation of a faculty member in the Division willing and able to serve as the student's Principal Advisor and research sponsor, after endorsement of the selection by the Program Director, Executive Committee of the Graduate School, and the Dean. In special circumstances, exceptions to this procedure may be made for students with unusual promise, but with no firm commitment to a particular area of research. In such case, the Program Director will serve as interim Principal Advisor. Finally, in the case that the Program Director would be the Principal Advisor of a student, the Physiology Department chairperson shall assume the duties of Program Director with respect to that student.



Course Requirements

All students admitted to the Division will be required to enroll in the Medical Physiology course as soon as practicable after admission. The course will be supplemented in certain areas by an extensive outside reading list and/or special tutorial study with the faculty. In addition, each incoming student will also be expected in the first year to enroll in the following courses, each involving tutorial study with one or more members of the faculty:

- PHYSO 502** Introductory Membrane Biophysics
- PHYSO 503** Physiology of Striated Muscle
- PHYSO 513** Cardiovascular Physiology
- PHYSO 514** Functional Neurophysiology

Other course requirements will be met by tutorial programs with faculty in the Division, by courses in other Divisions of the Graduate School, or by special arrangements with other institutions. The student and his Principal Advisor (in consultation with the Program Director) will choose elective courses based in part on the student's previous formal training in subjects deemed essential to work in his area of interest. Most students will be required to select a minimum of three additional courses from among those described in the course offerings of the Division of Physiology, but this requirement may be increased at the discretion of the Principal Advisor and Program Director.

It is anticipated that, occasionally, courses deemed essential to the student's graduate training by the Division will not be available in the Division of Physiology or other Division of the Graduate School. In this case, arrangements will be made for the student to enroll in such courses at neighboring institutions and performance in these courses will be required to be at the same level as for courses at Rush. In certain circumstances, a program of supervised independent study may be recommended as an alternative to particular course work.

Each student shall be required to pass a comprehensive preliminary examination which will insure a minimum necessary level of familiarity with all areas of modern physiological research. This examination will be arranged by the student and Program Director no later than 18 months after admission to the Division.

Thesis Proposal

Upon admission to the Division, the student and his/her Principal Advisor shall begin to make preparation for a proposal upon which the student's original research project will be based. Such preparations will include intensive study of the literature in the student's field of interest, instruction in the basic laboratory skills necessary for professional development in the field, and any other requirements established by the Principal Advisor and Program Director, in addition to the course requirements discussed above.

No later than eighteen months after admission, the candidate shall present to his/her Thesis Committee an original proposal for contribution to knowledge in his/her area of specialization. It shall include an extensive review of the relevant scientific literature, a description of the technical aspects of the proposed studies, an outline of the anticipated experimental approach to the major problem of interest, and a discussion of possible results and their interpretation. The student will be expected to defend both his/her proposal and general ability to achieve professional competence before this committee.

The Thesis Committee shall have at least three members: the Principal Advisor; the Program Director; and, whenever possible, an individual outside the institution with national stature in the candidate's field of interest selected jointly by the candidate, Principal Advisor and Program Director. In addition to evaluating the content of the Thesis Proposal, the outside member shall have a responsibility to maintain close and frequent contact with the student and Principal Advisor and to advise the Program Director concerning the progress of the academic program. Ordinarily, the Thesis Committee shall be constituted as soon as practicable after admission of a student to the Division.

Note that the Thesis Proposal may be submitted to the faculty prior to completion of course requirements or the preliminary examination in order to enable research activity to begin, but the student will not be formally admitted to candidacy until these are satisfactorily completed.

Candidacy

Upon successful completion of the preliminary examination and acceptance of the Thesis Proposal, the student shall be admitted to candidacy for the Ph.D. and shall be expected to devote fully his/her energies to the program. A minimum residency requirement of one calendar year following admission to candidacy must be met by all students unless special exceptions are granted by the Program Director and Dean. The Principal Advisor shall make frequent reports to the Program Director concerning the student's progress, and should either faculty

member or the candidate feel it appropriate, the Thesis Committee can be called into session to judge the student's continued participation in the graduate program, or possible alterations in the area of his research efforts. In addition, the student and Principal Advisor will be expected to consult periodically with the other committee members who may also request the Program Director to call formal meetings of the Thesis Committee.

Conflicts between the student and/or any members of the Thesis Committee not resolvable by the full Committee may be referred to the Advisory Committee of the Division or higher authority as specified in the Policies and Procedures of the Rush Graduate School and College of Health Sciences.

Thesis

The degree of Doctor of Philosophy is given in recognition of high attainment and ability in a particular field of scientific research as evidenced by submission of a dissertation showing power of independent investigation and forming an actual contribution to existing knowledge. Such dissertation will be submitted to the candidate's Thesis Committee for review and defended orally, at least three months before the degree is granted. The Thesis Committee will ordinarily request an evaluation of the candidate's dissertation by a scientist of national stature not affiliated with Rush University.

Acceptance of the dissertation by the Thesis Committee will be reviewed by the Executive Committee and the Dean, along with the candidate's entire academic performance in the Graduate School. Determination of completion of all requirements will result in the Dean's recommendation that the degree be awarded at the next scheduled commencement exercise of Rush University.

Should the candidate not have submitted a dissertation three years after admission to candidacy, the Thesis Committee shall be convened to evaluate the candidate's progress, and if it deems it proper to suggest alteration in the program.

General Policies of the Graduate School

This program is subject to changes required to conform to the general policies and provisions of the Graduate School adopted by the Executive Committee from time to time. However, major changes in policy shall not retroactively affect students already admitted to the program.

Research Areas Represented

Members of the Division carry out research in three overlapping areas: (1) transport and electrical properties of excitable membranes; (2) motor and sensory processing in the mammalian nervous system, and (3) circulatory phenomena.

Membrane properties. Both the transport and the excitability properties of membranes are under study.

The properties of the digitalis-receptor of the heart, a component of the $Na + K$ pump of the cardiac muscle membrane, are being studied. One project is focused on the physiological regulation of this system by hormones. Specifically, changes in cardiac performance that accompany altered thyroid function have been shown to result from altered synthesis of $(Na + K)ATPase$ in the cardiac muscle membrane. In a related study the autonomic nervous system was shown to regulate $(Na + K)ATPase$ via modulation of cyclic nucleotides. Finally, a technique for the automatic, continuous assay of $(Na + K)ATPase$ is being developed.

The basic ionic mechanism underlying the action potential is being studied in voltage-clamped giant axons. Previous investigations have shown that when examined in sufficient detail, the kinetics of sodium activation and inactivation show striking departures from the behavior expected for a system consisting of non-interacting, voltage-sensitive gates such as those implicit in the classical Hodgkin-Huxley formulation. Presently, both traditional voltage-clamp and internal perfusion techniques, and new procedures for noise analysis and measurements of intramembrane charge movements are being used to further elucidate the molecular details of the sodium and potassium channels.

Skeletal muscle fibers have a structure considerably more complex than nerve axons, including invaginations of the surface membrane which form a tubular system running almost transversely across the fiber. The structural and electrical properties of skeletal muscle fibers are being studied in some detail, and a detailed model of the electrical properties expected from the branching tubular system is being constructed by measuring such properties using methods of linear electrical circuit theory. Techniques include both sinusoidal and stochastic analysis. The theory and measurements are being extended to try to predict the shape and conduction velocity of the propagating action potential, the natural electrical signal which initiates contraction. Attention is also being paid to the mechanism by which the action potential occurring across the membranes of the tubular system initiates contraction.

Information Processing in the Central Nervous System. The processing of visual information by the mammalian nervous system is being studied in both human and experimental human preparations. The laterality of information processing in female subjects with Turner's syndrome is being investigated through the recording of visual evoked responses in the electroencephalogram. In animal models visual processing is being studied with microelectrode techniques (extracellular action potentials and evoked population responses); of particular interest here is the effect on the visual system of such homeostatic imbalances as hyperthermia and hypoxic hypoxia.

The control of motor behavior by the nervous system is also being studied in normal human subjects. Responses to different kinds of stimulus-induced errors introduced into the performance of various motor actions are being monitored. The latencies of these responses will provide information as to the CNS level at which they are generated, and their amplitudes will provide a measure of the general level of excitability at different segmental levels. By studying different types of motor actions and using different stimuli, singly and in combinations, it will be possible to uncover information about the motor mechanisms responsible for the coordination of voluntary and involuntary (reflex) behavior.

Circulatory Phenomena. Three separate projects are under way in this area. The effects of pulsation on blood flow in the laminar transition region are being studied. The pulse has been found to cause an early transition to turbulent flow, an effect which is strongly dependent on pulse amplitude but only slightly affected by pulse frequency. Furthermore, the effect is inversely related to tube length, being unimportant in tubes having the same geometry as actual blood vessels. These results indicate the importance of vessel geometry in protecting the circulation against excessive energy losses from turbulence. A second project in this area involves a study of the microcirculation of skeletal muscle. Of particular interest here is the distribution of flow and the transport of materials that occurs during exercise.

Finally, the responses of the cerebral vasculature to conditions of hypoxic hypoxia are being investigated. Local blood flow, tissue oxygen levels, and neural function (visual evoked responses) are being monitored in an attempt to determine the mechanism(s) responsible for the high sensitivity of the cerebral cortex to oxygen lack. Also of interest are the occurrence and mechanism of oscillations in tissue oxygen tension recorded in some parts of the brain.

Course offerings (*required)

***PHYSO 451**

Physiology I: Comprehensive medical physiology course covering all of the major organ systems. A conceptual approach to understanding of physiological functions is developed. Emphasis is placed on utilization of facts in problem-solving. Autumn staff.

***PHYSO 452**

Physiology II: Continuation of PHYSO 451. Winter staff.

***PHYSO 502**

Introductory Membrane Biophysics: Study of fundamental processes involved in movement of ions across membranes; excitability in nerve and muscle; equivalent circuit analysis; artificial membrane systems; structure of membranes; active transport processes. Autumn staff.

***PHYSO 503**

Physiology of Striated Muscle: Fundamentals of excitation - contraction coupling; mechanics of muscle; equivalent circuit analysis; muscle biochemistry; developmental aspects of nerve and muscle. Autumn staff.

***PHYSO 513**

Cardiovascular Physiology: Students will read and discuss the original papers which form the foundations for our current understanding of heart function and control, peripheral vascular control, and transcapillary exchange. The works will be evaluated both in terms of their significance at the time and their present relevance. Winter staff.

***PHYSO 514**

Functional Neurophysiology: The course will deal with physiology of neurons and glia; synaptic processes; sensory receptor physiology; spinal cord; cerebellum and motor control; peripheral mechanisms in sensory systems; higher functions of the nervous system. Relevant neuroanatomical concepts will be included. Winter staff.

PHYSO 521

Cell Structure and Function: Current concepts of the structure and function of various cell organelles; histochemistry; introduction to techniques of electron microscopy. Dr. B. Eisenberg. Alternate years by arrangement.

PHYSO 522

Circuit Theory and Practical Design: A tutorial laboratory course designed to acquaint the student with the principles of design and construction of various electronic equipment commonly encountered in modern physiology. V. Guiffre. By arrangement.

PHYSO 523

Linear Differential Equations and Transform Methods: First and higher order linear equation; linear algebra techniques; finite difference equations; Fourier series and transforms; Laplace transforms; applications to solution of differential equations. Dr. Mathias. Alternate years by arrangement.

PHYSO 524

Linear Systems Analysis: Block diagrams; feedback; frequency domain analysis; noise and its analysis; partial differential equations and their solution. Dr. Mathias. Alternate years by arrangement.

PHYSO 526

Control in Physiological Systems: Control theory; the human motor system; feedback interactions in the human motor system. Dr. Gottlieb. Alternate years by arrangement.

PHYSO 641

Molecular Mechanisms in Control of Ion Permeability: Advanced course dealing with special topics in the molecular control of excitability; laboratory instruction in voltage clamp techniques. Prerequisite Physiology 501. Dr. Schauf. Alternate years by arrangement.

PHYSO 651

Advanced Topics in Muscle Physiology: Equivalent circuit of skeletal muscle; problems in excitation-contraction coupling; molecular events in the generation of mechanical force. Dr. Gilai; Dr. Eisenberg. Alternate years by arrangement.

PHYSO 652

Active Transport Processes: A detailed study of the physiological and biochemical processes involved in the energy-dependent translocation of solutes across cell membranes. Dr. Hegyvary. Alternate years by arrangement.

PHYSO 653

Problems in Synaptic Physiology: A detailed review of current experimental and theoretical problems in transmitter release and activation of post-synaptic receptors. Dr. Pencek. Alternate years by arrangement.

PHYSO 654

Selected Topics in Cardiovascular Physiology: Current papers in active research areas of cardiovascular physiology will be read and discussed. Exact topics will vary with specific student and faculty interest, but may include: blood flow dynamics, vascular wall dynamics, exchange and control in the microcirculation, exercise physiology, modeling of the cardiovascular system, etc. Drs. Rovick and Starr. Alternate years by arrangement.

PHYSO 655

Topics in Visual Physiology: An advanced tutorial covering current problems in the function of visual receptors and processing of visual information. Drs. Levett and Michael. Alternate years by arrangement.

PHYSO 699

Research in Physiology: (1/3-full time). Staff. By arrangement

Affiliated Colleges

Students who seek entrance to the baccalaureate programs in medical technology at College of Health Sciences apply directly to the affiliated colleges of their choice. Each college provides an excellent basis for the professional portion of the undergraduate programs at the Rush campus.

The participation of each affiliated college with Rush is unique. Carleton and Grinnell ask that students spend three years on their campuses before coming to Rush for the final two years. The other twelve schools require a minimum of two years academic residence. Several schools offer dual degrees—one from Rush with a major in medical technology, and one from the affiliated college in another major. Each campus specifies requirements for the second degree. Carleton participates only in the undergraduate nursing program. The pre-health curriculum also varies from campus to campus because of scheduling, curricular offerings and course descriptions. For specifics about each college it is best to check with the admissions office or health careers advisor on the campus. The affiliated colleges are:

Beloit College
Carleton College
Coe College
The Colorado College
Cornell College
Fisk University
Grinnell College
Illinois Institute of Technology
Knox College
Lake Forest College
Lawrence University
Macalester College
Monmouth College
Ripon College

Although the colleges are characterized by their own styles, traditions and programs, each is noted for its academic excellence and liberal arts tradition. The choice of where students spend the first years of undergraduate study is their decision. They may choose any one of the fourteen affiliated colleges. Each is a port of entry to the baccalaureate program of the College of Health Sciences, Rush University. We hope that the following brief descriptions of each of the colleges will help students make informed decisions.

Beloit College

Beloit, WI 53511
(608) 365-3391 (ext. 244)

Enrollment 1976-77

Total: 1198

Men: 599

Women: 599

Calendar

Trimester Plan

Admissions Tests Required

S.A.T. or A.C.T.

Admissions Interview
Strongly encouraged, but
not required

Costs 1977-78

Total: \$5390

Tuition: \$3930

Room and Board: \$1460

Beloit College was founded in 1846, two years before Wisconsin was chartered as a state. For over one hundred and thirty years the College has maintained a tradition of academic excellence, combined with on-the-job work experience, called the Field Term.

The student-faculty ratio is 14 to 1; therefore classes are generally small. All of the science faculty hold Ph.D.'s and department chairmen teach introductory as well as advanced courses. The Science Center consists of Chamberlain Hall, a five story laboratory-classroom building; Mayer Hall, an auditorium-library building; Kohler Science Library; and Pierpont Wood Conservatory (Greenhouse). Special facilities include the Thompson Observatory with a 22-inch Celestron telescope, a particle accelerator designed and built by students and faculty, and individual research laboratories for students pursuing undergraduate research. Two off-campus areas, Chamberlin Springs and Smith Limnology Laboratory, are used for field work in the sciences. In addition to traditional classroom approaches, members of the science faculty have introduced laboratory sessions that allow students to investigate new problems in a real-life manner, collecting data to provide answers to those problems. Background courses are available in Chemistry and Mathematics for entering students who have insufficient preparation in those areas. It is important to note that students intending to enroll at Rush University are not required to participate in Beloit's off-campus work program, the Field Term.

The College is located on a 65-acre wooded campus in a community of 36,000 on the Wisconsin-Illinois border, surrounded by farmland and recreational areas. Beloit is 100 miles from Chicago, 75 miles from Milwaukee and 50 miles from Madison. Students from all over the United States and several foreign countries come to Beloit College for an education that produces a distinctive graduate.



Carleton College

Northfield, MN 55057
(507) 645-4431 ext. 511

Enrollment 1976-77

Total: 1792

Men: 962

Women: 830

Calendar

3-3-3 Plan

Admissions Tests Required

A.C.T. or S.A.T.

Admissions Tests

Recommended

English Comp. achievement test,

2 other achievement tests

Admissions Interview

Recommended

Costs 1977-78

Total: \$5277

Tuition and Fees: \$3702

Room and Board: \$1575

The definition of a Carleton education has over 1700 variations, as is evident in the broad selection of majors chosen by its some 1700 students, either from conventional fields of interest or planned on an individualized basis.

Diversity and individuality both in the student body and in academic programs are an integral part of the college's purpose. Just as no two entering students are alike, no two Carleton graduates fit into a particular mold. They all, however, have been exposed to a range of liberal arts disciplines and have learned to question dogma, value the scientific method and sensitively and humanely make ethical decisions.

Carleton's 90-acre main campus, site of its fine science complex, music and drama center, library and Lyman Lakes, is surrounded by nearly 900 acres of natural woodland and prairie which is utilized as an educational resource as well as a recreation area.

Located in the southeastern Minnesota community of Northfield, a city of 10,000, Carleton is 40 miles south of Minneapolis and St. Paul and easily accessible by public transportation.



Coe College

Cedar Rapids, IA 52402
(319) 398-1611
(from Iowa 1-800-332-8404)

Enrollment 1976-77

Total: 1134

Men: 514

Women: 442

part-time: 178

Calendar

4-1-4 Plan

Admissions Tests Required

S.A.T. or A.C.T.

Admissions Interview

Encouraged, but not required

Costs 1977-78

Total: \$4310

Tuition and Fees: \$3060

Room and Board: \$1250

At Coe, through the "open choice" curriculum, students are responsible for making their college experience a meaningful one. A student has the freedom to choose from any of Coe's departmental offerings and build a varied and challenging individual curriculum along with the courses needed for completion of a major. Education does not end in the classroom, however. Students may elect a single term or academic year for studying in one of the 50 foreign and domestic off-campus programs; or, for testing career possibilities, students may participate in a work/service project or work internship.

At Coe, there are students from 40 states and 16 foreign countries. The college is situated in the urban/residential area of Cedar Rapids, a growing progressive metropolis in eastern Iowa with a population of 135,000.

Degrees offered include Bachelor of Arts, Bachelor of Music, and Bachelor of Science in Nursing, from the 28 departmental and interdepartmental concentrations. Many students who are interested in pursuing a medical or health profession will utilize the interdepartmental General Science curriculum. Coe provides for its science students modern and elaborate facilities and full use of its quality equipment. Coe is accredited by the North Central Association of Colleges and Schools, the American Chemical Society, National Association of Schools of Music, and the Iowa State Department of Public Instruction.

Coe has an interesting faculty, of whom 70 percent have received their Ph.D.'s and are strongly committed to their roles as teachers. The 13-to-1 student/teacher ratio permits small and intimate classes and individual attention for the students. Coe maintains the philosophy that intellectual and emotional growth is best nurtured in an environment that is stimulating academically and supportive socially. Coe believes that a liberal arts education will best serve the individual, in preparing for the broad ranges of experiences to come, through the developing of skills for rational and critical thinking, adequate self-expression, and perceptive dealings with other human beings. Education should be a part of the growth process and Coe would like to have a part in that process.



The Colorado College

Colorado Springs, CO 80903
(303) 473-2233, ext 219, 220

Enrollment 1976-77

Total: 1850

Men: 962

Women: 888

Calendar

Block Plan

Admissions Tests Required
S.A.T. or A.C.T.

Admissions Interview
Not required

Costs 1977-78

Total: \$5000

Tuition and Fees: \$3600

Room and Board: \$1400

Colorado College offers an innovative departure from the view of education as business as usual. Under the Colorado College Plan, the academic year is divided into nine 3½-week "blocks," separated by 4½-day block breaks. Most courses are completed in one block, though a few span two or even three blocks. A student takes only one course per block.

The Colorado College Plan holds many advantages; it has reduced class size to an average of 14 students; it allows freedom in scheduling classes, so that an astronomy class might meet at midnight, or a biology class can go into the field for a week; it allows the College to attract distinguished visiting professors with ease; and it has contributed to greater involvement in the educational process on the part of the students.

Colorado College is an independent, coeducational liberal arts college. It occupies a 79-acre campus in Colorado Springs, a city of 200,000 in a metropolitan area of 300,000. It is located at a point where the high western plains meet the Rocky Mountains. The surrounding area offers a natural laboratory for many disciplines, as well as a variety of recreational activities.



Cornell College

Mt. Vernon, IA 52314
(319) 895-8149

Enrollment 1976-77

Total: 885

Men: 462

Women: 423

Calendar
4-1-4 Plan

Admissions Tests Required

S.A.T. or A.C.T.

Admissions Interview
Recommended

Costs 1977-78

Total: \$4900

Tuition & Fees: \$3566

Room and Board: \$1,334

Cornell's 100-acre, wooded hilltop campus overlooks the historic village of Mt. Vernon, Iowa, located 15 minutes east of metropolitan Cedar Rapids amid rolling tracts of trees and farmland.

Cornell has a 125-year tradition of academic excellence, and a reputation, for which our science programs have been largely responsible, to match.

Nearly 70 per cent of Cornell's science majors in the last 15 years have entered graduate programs in health careers or the physical sciences. In the past 4 years, Cornell has earned a 70 per cent success rate in medical school placements.

Cornell's position in the vanguard of undergraduate science education was bolstered this past academic year by the completion of the \$2 million center for biology and chemistry, which provides Cornell students and faculty with state-of-the-art laboratory, classroom, and library facilities. The West Science Center for biology and chemistry was environmentally designed, with many energy conservation features built in. It is naturally ventilated, contains insulation far in excess of normal standards and features triple glazed windows. It is equipped with solar heating capability for future development.

But the strength of the sciences at Cornell lies in a talented and dedicated teaching faculty, all of whom hold doctorates from leading institutions. And although teaching is their highest priority, the faculty are well represented in the research and publishing fields and apply themselves to Cornell and ACM off-campus programs as well.

Gerard Piel, publisher of *Scientific American*, visited Cornell in 1975 and wrote, "its science faculty is first rank. . . Their teaching proceeds from research. . . but their professors put a lot more time and heart and brains into their teaching than the distinguished professors at our great 'research' universities."

Cornell of Iowa. 125 years of quality in action.



Fisk University

Nashville, TN 37203
(615) 329-8665

Enrollment: 1976-77

Total: 1280

Men: 519

Women: 761

Calendar
Semester

Admissions Tests Required
S.A.T. or A.C.T.

Admissions Interview
Not required

Costs 1977-78
Total: \$3735
Tuition: \$2350
Room and Board: \$1385

Learning at Fisk University is a dynamic, living experience. The university presents numerous socially-oriented programs through an interdisciplinary approach to higher education. At Fisk, Black Studies become part of a balanced, intracurricular program.

Fisk is located on a 40-acre campus near the downtown area of Nashville, Tennessee. It offers programs leading to the B.A., B.S., and M.A. degrees in 26 major areas of study in the social sciences, natural sciences, mathematics, humanities, physical education and health.

The traditional excellence of Fisk's programs and its students is evidenced by the fact that in 1930, Fisk became the first Black college to receive full accreditation by the Southern Association of Colleges and Schools. In 1952, the school established a chapter of the Phi Beta Kappa Honor Society. In 1975, Fisk became the first predominantly Black institution to have a national chapter of Mortar Board. Other national academic societies, as well as major Black national sororities and fraternities, have chapters on the Fisk campus.

For sports enthusiasts, complete outdoor sports and recreation facilities, including athletic fields and tennis courts, are available. A municipal golf course is nearby. Fisk students have the opportunity to participate regularly in intercollegiate sports competition.



Grinnell College

Grinnell, IA 50112
(515) 236-4848

Enrollment 1976-77

Total: 1161

Men: 649

Women: 512

Calendar

Semester Plan

Admissions Tests Required
S.A.T. or A.C.T.

Admissions Interview
Not Required

Costs 1977-78

Total: \$5170

Tuition and Fees: \$3995

Room and Board: \$1175

Grinnell is a private, coeducational, liberal arts college which enrolls students from all parts of the United States and from many foreign countries. Life on the Grinnell campus is informal and individualistic.

Grinnell stresses an integration of private and public responsibility: the first with its attributes of self-knowledge, self-reliance, and intellectual discipline, the second with its qualities of social conscience and concern for public welfare.

Grinnell offers courses of study in the humanities, sciences, social studies, elementary and secondary education, physical education, and other programs. A faculty-student ratio of 1 to 12 permits ample opportunity for independent study, including the Freshman Tutorial Program, guided reading, special projects, and advanced group study.

The attractively landscaped 90-acre campus in a small south-central Iowa city has 35 buildings, including residence halls. Among recreational facilities is the large, multiple-use Physical Education Complex.



Illinois Institute of Technology

Chicago, IL 60616
(312) 567-3025

Enrollment 1976-77

Total: 3444

Men: 2890

Women: 554

Calendar

Semester Plan

Admissions Tests Required
S.A.T. or A.C.T.

Admissions Interview
Recommended

Costs 1977-78

Total: \$4470

Tuition: \$3000

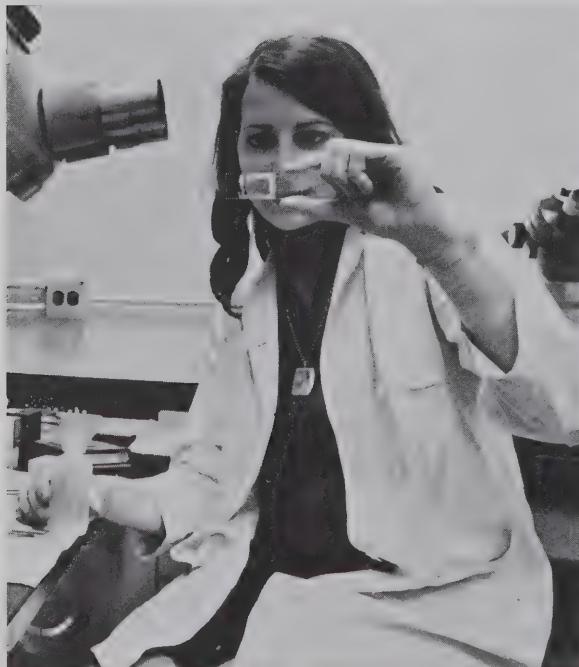
Room and Board: \$1470

Illinois Institute of Technology is a medium-sized, private, coeducational university emphasizing preparation for professional careers in the sciences, engineering, the social and behavioral sciences, the humanities, architecture, planning, design, managements, finance, and law. It offers undergraduate and graduate degree programs through six schools and colleges on both a full-time and part-time basis. In addition, excellent pre-professional programs are available to prepare students for postgraduate study in medicine, dentistry and law.

Because of IIT's scope and flexibility, students have the opportunity to achieve both personal and professional goals. Opportunities to investigate a broad range of disciplines, pursue specialized programs in nontraditional areas such as biomedical engineering, and, with approval, to design individualized programs, are part of the IIT approach to learning. In all areas, including biology, chemistry, and physics, IIT excels on the undergraduate, graduate, and research levels.

The 120-acre campus is located on the near South Side of Chicago, approximately four miles from the Chicago Loop. Campus facilities include the IIT Research Institute, the Institute of Gas Technology, the John Crerar Library (1,300,000 volumes), a shopping center and service station, gymnasium and recreation area, six dormitories, nine resident fraternity houses and the student union.

Applications are welcome from all students who are earnestly interested in an education that prepares them for professional practice.



Knox College

Galesburg, IL 61401
(309) 343-0112

Enrollment 1976-77

Total: 1095

Men: 629

Women: 466

Calendar

3-3-3 Plan

December Mini-term

Admissions Tests Required
S.A.T. or A.C.T.

Admissions Interview
Required

Costs 1977-78

Total: \$5190

Tuition: \$3795

Room and Board: \$1395

Knox-Rush students have something to say about their experience in the program.

Lisa Arthur, (nursing) sophomore from Glencoe, IL: "I am planning to graduate from Knox College with a biology and Spanish major. Next year I will be studying in Barcelona, Spain with Knox's program for junior year abroad."

Pam Wetterauer, (medical technology) junior from Downers Grove, IL: "I am combining mathematics and computer science with my chemistry major which will allow me to work with hospital and/or laboratory computers and instruments."

Geraldine Harlan, coordinator of the Knox-Rush Nursing and Medical Technology programs, counsels all men and women interested in the programs. Mrs. Harlan's responsibility is indicative of the concern of the College for the success of the programs.

Knox College, founded in 1837, has for 140 years been dedicated to providing quality education for its students. The College occupies a 60-acre campus located two blocks from downtown Galesburg, a city of approximately 38,000.

The Knox year is divided into three ten-week sessions and one six-week session, the latter, an optional mini-term occurring between Thanksgiving and Christmas. During the mini-term, students are free to find work or to continue their studies.

In addition to the 2-2 Plan (two years at a liberal arts college—two years at Rush), Knox has a 3-2 Plan, under which, upon completion of the program, students may earn a bachelor of arts degree from Knox and a bachelor of science degree from Rush.

Of the freshmen enrolled at Knox during 1976-77, 42 per cent ranked in the upper 10 per cent of their high school graduating classes. Of faculty members teaching in the 19 areas of study offering a major, 93 per cent hold the Ph.D. degree. The student-faculty ratio at Knox is 13 to 1.



Lake Forest College

Lake Forest, IL 60045
(312) 234-3100, ext. 243

Enrollment 1976-77

Total: 1046

Men: 547

Women: 499

Calendar

3-2-3 Plan

Admissions Tests Required
S.A.T. or A.C.T.

Admissions Interview
Encouraged, but not
required

Costs 1977-78

Total: \$5515

Tuition and Fees: \$4000

Room and Board: \$1575

Lake Forest College is committed to the development of creative individuals who will live lives of leadership and service. The College has chosen to be a small community where close personal relationships exist among 87 full-time faculty and 1,046 students. More than 80 per cent of the faculty hold the Ph.D. degree. The College maintains a faculty-student ratio of approximately 1 to 12. The diverse student body represents 40 states and 19 foreign countries.

Founded in 1857, Lake Forest College is located on 107 wooded acres in the residential community of Lake Forest, less than a mile from Lake Michigan and 32 miles north of Chicago. The location of the College in the Chicago metropolitan area means that internships and field research projects are important elements of the academic program. To facilitate such experiences the College's seven-week Winter Term allows students to take program-related jobs or pursue individual research.

Flexibility and self-determination also highlight the curriculum. A B.A. degree is offered after 32 courses are successfully completed from among the traditional department majors (or one of nine interdisciplinary majors). In 1974 Lake Forest pioneered the concept of undergraduate institutes with the inauguration of the Robert E. Wood Institute for Local and Regional Studies. This Institute, the first of several planned at the College, explores the social, economic and political problems of expanding urbanization.



Lawrence University

Appleton, WI 54911
(414) 739-3681, ext. 232

Enrollment 1976-77

Total: 1320

Men: 653

Woman: 667

Calendar

Three terms, ten weeks each

Admissions Tests Required

S.A.T. or A.C.T.

Admissions Interview
Encouraged, but not
required

Costs 1977-78

Total: \$5300

Tuition: \$4022

Room and Board: \$1278

At Lawrence University, students are able to take advantage of an outstanding faculty, first-rate facilities and the type of challenging, broad-based curriculum which one normally associates with a much larger institution. Because of Lawrence's low student-faculty ratio (11 to 1), students who wish to do so may work closely with faculty members in tutorials, on research and in independent study projects.

The faculty, 95 per cent of whom hold the Ph.D. or the highest degree in their field, staff strong programs in the physical sciences, social sciences and humanities. In addition the University's Conservatory of Music, theatre-drama and art departments provide instruction in the fine arts, while enhancing life both on campus and in Appleton, a bustling city 200 miles north of Chicago and 100 miles north of Milwaukee.

Students may pursue majors offered by 22 departments or, alternatively, design their own programs of study.

As in every other aspect of life, quality in education does not come cheaply. Many students at Lawrence, however, receive grants, workstudy jobs and loans to help offset the costs of their education. In the 1976-77 academic year, nearly 50 per cent of the University's students received approximately \$2.3 million in financial aid.



Macalester College

Saint Paul, Minnesota 55105
(612) 647-6203

Enrollment 1976-77

Total: 1637

Men: 820

Women: 817

Calendar

4-1-4 Plan

Admissions Tests Required

S.A.T. or A.C.T.

Admissions Interview

Recommended

Costs 1977-78

Total: \$5000

Tuition: \$3600

Room and Board: \$1400

Macalester is a four-year coeducational liberal arts college with a flexible curriculum centered in 26 academic departments. The College, which began its second century in 1974, has achieved distinction in individualized learning, internationalism, cooperative programs with other colleges, community involvement and its commitment to minority youth. Macalester has outstanding resources in people, programs, and physical facilities on its 50-acre campus. Its location in a residential area, midway between the downtown areas of Minneapolis and St. Paul, provides an educational environment which draws upon and contributes to the Twin Cities.

The faculty, 80 per cent of whom have doctorates, is comprised of scholars who are dedicated teachers. The typically small classes—12 to 1 student/faculty ratio—insure personal attention for every student.

Macalester students come from almost every state and more than 35 foreign countries, and nearly 10 per cent of the College's more than 1,600 students are from minority backgrounds. In the fall of 1976, 76 National Merit Scholars were enrolled. In the past 10 years Macalester has had three Rhodes Scholars. Since 1971, 20 students have won Fulbright-Hays Scholarship and related awards. In the past two years, Macalester has had six students receive prestigious National Science Foundation Graduate Fellowships.

Macalester graduates have always had a special affinity for the service professions (medicine, government, education, etc.) and approximately 35 per cent of the recent graduates have continued their education in graduate and professional schools.

The College attempts to meet the financial needs of its students through an extensive financial aid program of over \$1.4 million.



Monmouth College

Monmouth, IL 61462
(309) 457-2131

Enrollment 1976-77

Total: 700

Men: 400

Women: 300

Calendar

3-3-3 Plan

Admissions Tests Required
S.A.T. or A.C.T.

Admissions Interview
Recommended

Costs 1977-78
Total: \$4440
Tuition: \$3030
Room and Board: \$1410

At Monmouth, our entire effort is directed toward teaching students well, and providing the opportunity for each student to achieve the maximum individual growth of which he or she is capable—academically, socially, spiritually, morally and physically. The college seeks for admission those students who can both profit from and contribute to the total educational programs of the college.

A Monmouth education is an individual experience, its breadth and extent limited only by the willingness of students to learn from a wide range of major fields of study, independent study programs, work experience, volunteer programs, internships, off-campus programs, and a broad array of social and cultural activities. Allied closely to this is the idea that a liberal arts education is a viable link to the future, and the college attempts to strengthen this link through small classes, frequent student-faculty interaction, independent and interdisciplinary study, advanced placement, honor programs, and the opportunities for special work.

With the recently erected Haldeman-Thiessen Science Center and a natural sciences and mathematics division in which every professor holds the Ph.D., Monmouth's programs in these areas are among the best in the Midwest.

The Monmouth curriculum allows students to choose from four different types of majors, and students may tailor a plan of study to fit their own particular needs. As well, advanced placement, credit by examination, and other options allow well-qualified students to accelerate the normal four-year program of three terms per year, three courses per term. Monmouth's residential campus of 700 students and 65 faculty makes the student-faculty ratio 11:1. Monmouth College was founded in 1853 and is related to the United Presbyterian Church.



Ripon College

Ripon, WI 54971
(414) 748-8102

Enrollment 1976-77

Total: 950

Men: 530

Women: 420

Calendar

Semester Plan

Admissions Tests Required

S.A.T. or A.C.T.

Admissions Interview

Recommended

Costs 1977-78

Total: \$4790

Tuition and Fees: \$3547

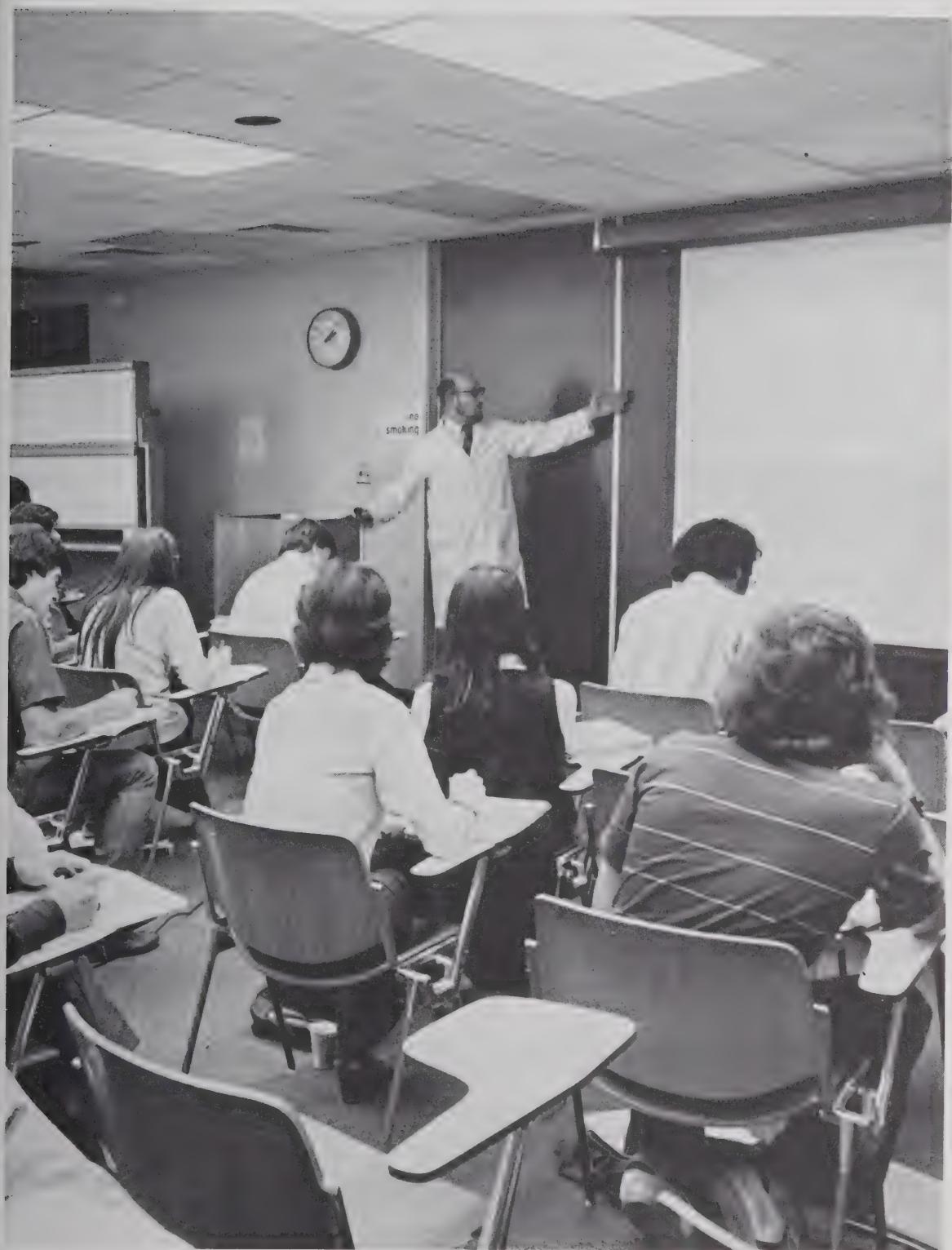
Room and Board: \$1243

Ripon, an independent, coeducational college of the liberal arts and sciences, founded in 1851, has retained the thoroughly tested principles of liberal education while developing innovations which make learning enjoyable, challenging, and rewarding. For well over a century, Ripon graduates have gone on to satisfying and responsible careers in virtually every profession and vocation.

Ripon students come from 44 states and 18 foreign countries, and from diverse social, ethnic, racial and religious origins. Faculty members—70 per cent of whom hold the Ph.D.—are committed to teaching and advising above all other scholarly or professional activities. Since all faculty members teach both introductory and advanced courses, and since the student-faculty ratio is only 12 to 1, students can work closely with outstanding teachers from the beginning of their college careers. More than 70 per cent of the classes have fewer than 20 students.

Ripon also offers a full complement of extra-curricular activities and counseling services. Thus a Ripon education can embrace all aspects of a young person's development.





Course Descriptions

Course Abbreviations

Courses listed and described in this section are Rush University courses expected to be offered by faculty of the College of Health Sciences for the 1977-78 academic year, and do not represent a complete catalog of Rush University courses.

All Rush University courses are listed alphabetically according to the *discipline* to which the course content is most closely related. These disciplines do not necessarily reflect a *department* in the University or in the Medical Center.

Course Numbers

A three-digit course number follows the course abbreviation. Courses numbered 300-399 are third level courses; courses numbered 400-449 are fourth year level courses; courses numbered 450-499 are dual level and may be taken for undergraduate or graduate credit; courses numbered 500-599 are graduate level; 600 represents the doctoral level.

Course Content

The course title is followed by a brief description of course content. At the end of each course description are three hyphenated numbers, e.g., (2-3-3). The first number refers to hours per week in the classroom or seminar; the second, the number of hours per week in laboratory or clinical setting; the third, to numbers of quarter hours of credit.

Independent Study Courses

Students may enroll in an independent study course in any discipline of the University under the direction of the appropriate faculty member with his or her written permission, and the approval of the Office of the Dean.

The course numbers 441 and 591 will be used for *Independent Clinical Study*, with the appropriate discipline prefix.

The course number 449 will be used for academic *Independent Study* for undergraduates and 599 for *Independent Readings* for graduate students, with the appropriate discipline prefix.

Introduction of New Courses

Upon approval of the faculty, new courses not listed in the catalog may be listed as *Special Topics* under the appropriate discipline prefix and the numbers 300, 400, or 500 to indicate the level of offering. The topic covered will be listed on the student's academic record.

Course Offerings

Anatomy

ANAT 451

Human Anatomy. The structure and function of the human body is examined topographically through laboratory dissection, lectures and preceptorials. Laboratory dissection is conducted regionally, encompassing the thorax, abdomen, pelvis, perineum, head and neck. Radiological anatomy, living anatomy and clinical correlations are emphasized throughout. Fall. 65 hours.

ANAT 452

Human Anatomy II. Continuation of ANAT 451. Winter. 65 hours

ANAT 453

Human Anatomy III. A laboratory dissection of the extremities and back that serves as the fundamental basis to understanding the pathophysiology of locomotion and posture. An integral part of PPHYS 551 Locomotor System. Spring. 40 hours.

ANAT 455

Histology. This course is an introduction to the use of the microscope. The microscopic anatomy of cells, tissues and organ systems of the human body are studied through laboratories, lectures and preceptorials. Special attention is given to the fine structural anatomy of cell organelles and individual specializations revealed by the electron microscope. Functional and clinical correlations are emphasized throughout. Fall. 51 hours.

ANAT 460

Neuroanatomy. The morphological organization and correlated functions of the central nervous system are examined in the laboratory by slides and dissection of fixed brains. This program is fundamental to understanding the pathophysiology of the nervous system, and is an integral part of PPHYS 556, Neurosensory Communicative System. Winter. 30 hours.

ANAT 601

Surgical Anatomy. This course is principally a laboratory program of regional dissections and demonstrations. The applied, clinical and surgical aspects of anatomical regions are emphasized. Fall, Winter, Spring. Prerequisite: ANAT 451, 452, 453 or equivalent. 30 hours.

Behavioral Science

BEHAV 381

Research Methodology. Methods for theory construction and theory testing. Hypotheses and concept development, operationalization and measurement, sampling, research designs, observational methods, scaling and analysis of data. (3-0-3)

BEHAV 451

Fundamentals of Behavior. Provides the medical student with the basic conceptual framework and terminology that are used to describe and explain human behavior. It is divided into three sections: biological, psychological, and sociocultural. Primary emphasis throughout is upon the ways such various types of influences interact with health care delivery. It is designed as a series with BEHAV 452 and 453. (23 hours)

BEHAV 452

Observation and Communication. Introduction to the interview technique and process. The interview as a tool which facilitates the doctor-patient relationship and produces reliable and valid medical information. Interview theory, determinants of patient behavior and practice of interview skills. Weekly seminars utilize video tapes. (28 hours)

BEHAV 453

Behavior in the Life Cycle. Introduction to a clinically based study of the individual life cycle. Emphasis is on the biological, psychological, and sociocultural factors on adaptation during each phase of the life cycle. Lecture and Discussion. (30 hours)

BEHAV 454

Human Communications. Theory and Practice: A survey of some major contemporary theories of human communication: cultural, social-psychological, and mathematic-cybernetic, and applications to interpersonal and group modes of interaction. Special emphasis on influence, persuasion, adaptation and change as interpersonal tasks in the health sciences. (4-0-4)

BEHAV 461

Death and Dying Seminar I. An examination of the fears and feelings elicited by the clinical experience of contact with the dying patient, the fears and feelings of the critically ill patient and how to deal realistically with these fears in a clinical setting. Includes supervised patient contact. Permission of instructor. Graded P or N. (2-0-2)

BEHAV 462

Death and Dying Seminar II. Continuation of BEHAV 461. Individual conferences with advanced students on problems raised in their clinical experiences. Graded P or N. (1-3-2)

BEHAV 501

Behavioral Dynamics. Selected topics provide the basic concepts of intra- and inter-personal behavioral dynamics. The course is designed to aid the clinical specialist or nurse practitioner in understanding the emotional needs of both psychiatric and non-psychiatric patient populations and to guide staff intervention in meeting these needs. Topics include developmental changes with age; socialization and resocialization; personal adjustment mechanisms in stress, conflict, and anxiety; group dynamics and leadership. (4-0-4)

BEHAV 511

Behavioral Deviations. Introduction to psychopathology relevant to almost all types of medical practice but of special importance as preparation for psychiatry. General contexts of behavior, psychiatric syndromes, intervention modalities and research. (27 hours)

BEHAV 521-531

Mini-Course Matrix. A matrix of special topic seminars is presented allowing a concentrated introduction to a significant area of behavioral study. BEHAV 521 offered in Fall; 531 in Spring. The following topics were presented in 1976-77. Topics may be added or deleted in subsequent years. (10 hours each unless specified).

Chronic and Terminal Illness in Children: Topics for the sessions will include: the child's view of the hospital setting, a review of research relating to the effects of illness and hospitalization on children, cultural attitudes toward illness and death, adjustment to chronic illness, and characteristics of successful coping. The test will be based upon a case study of a person who has experienced serious illness or upon the reaction of a member of the primary family.

Neuropsychological Attributes of Aging: This course will consider changes in behavior which accompany aging, explore the neuropsychological and psychophysiological correlates of these changes, and suggest implications for general medical care of the elderly; the course will also provide the student with a basic knowledge of psychopathology of aging.

Medical Ethics: This course is intended to provide a context and a conceptual and clinical framework for exploring, questioning, and valuing the "art" and "science" of medicine and health care. While some historical review will be presented, the primary attention will be articulating and examining: understandings of the nature of personhood, values and meanings which underlie clinical experience, trans-medical meanings in health care, styles and philosophies of leadership in health care, and integrative dimensions of medicine and health care. Current clinical experiences will be examined. (20 hours)

Human Development in Infancy: Issues in Infant-Caretaker Interactions: This course will review the complex process of attachment which evolves between infant and caretaker, focusing on biologic, psychologic, and evolutionary factors which influence the attachment process. Key issues to be highlighted are the impact of multiple caretakers (kibbutz, child care centers, hospitals) upon development, the effects of privation and deprivation upon attachment (neglect, institutionalization, child abuse), disorders of mothering and their effects, the importance of attachment in infancy as a precursor for early learning, and personality development.

Behavior Genetics of Intelligence and Intellectual Dysfunction: This course will consist of an introduction to behavior genetic theory and method. It will review the current status of knowledge concerning the normal distribution of intelligence, degrees and types of mental subnormality and dysfunction. Implications for medical practice will be reviewed and discussed.

Effects of Chronic Disease upon Behavior: This course will consider relationships between various chronic diseases and behavior. Correlations between pre-morbid personality traits and disease incidence will be explored, as well as the association of organic change with neuropsychological manifestations. Among the chronic diseases considered will be hyper- and hypothyroidism, cardiovascular disease, and alcoholism.

Sleep and Its Pathology: Focusing on a thorough understanding of human sleep, this mini-course describes the electrophysiology of sleep and its stages, the neurophysiology and neuropharmacology of sleep, correlates of dreaming, the need for sleep and dreams, and relation of sleep and dreams to psychiatric disorders. Attention will be given to the diagnosis and treatment of sleep disorders in medical practice.

Principles of Counseling for Medical Practice: This seminar will investigate the counseling relationship as it might exist between a physician and his patient. Models of counseling will be reviewed, components and techniques of effective intervention will be discussed and applied to health care problems. This course is designed to assist the medical practitioner in applying medical knowledge effectively within the personal, familial, and social contexts.

Psychotherapy of the Late Adolescent: This course will focus on pivotal problems of the "self" in adolescent development including identity formation and sexuality. Topics will include ego-identity, sexuality and homosexuality, predominant themes of wholeness, self completion, and self-realization. Discussion of a brief psychotherapy case will illustrate these problems and how they can be worked with.

Disease, Stress, and Biofeedback: This course considers medical conditions where stress is a major etiologic or associated factor. The effects of stress on physiologic and psychologic processes are reviewed and the implications for treatment and management of specific acute and chronic conditions are discussed. Syndromes of interest include tension headache, pain of diverse etiologies, essential hypertension, ulcerative colitis, and multiple sclerosis. Emphasis will be placed on the role of biofeedback and relaxation therapies in control of autonomic and skeletomuscular functioning, and on the role of short-term counseling in chronic diseases. The identification, treatment, and/or referral of patients will be discussed as this relates to general medical practice.

Adolescent Pregnancy: This course is designed to review the cultural, socioeconomic, emotional, and psychological aspects of adolescent pregnancy. Adolescence as a stage of human development forms the background for a discussion of the incidence and prevalence of adolescent pregnancy and the implications for the health provider. Prevention of unwanted pregnancy, anticipatory guidance, abortion, and methods of family planning will be covered.

Professional Interaction in the Health Care Delivery Team: A variety of models are available for organizing the talent of the members of the health care delivery team in the process of providing care. The utility and disutility of these various models will be explored in light of new conceptual designs of care that have created new roles and blurred others. Finally, an attempt will be made to assess how developments in and across the health professions (e.g., joint practice activities) influence professional interaction and ultimately patient care as well.

Aspects of Schizophrenia and Related Psychotic Disorders: This course begins with a review of the history of schizophrenia, and presents various interpretations of the nature of the disorder. Clinical symptomatology and classification will be reviewed with emphasis on descriptive psychopathology. The affective psychoses will be introduced for comparative purposes. Theories of etiology, including recent research which views schizophrenia as a communication disorder, will be examined, and implications for treatment and management will be considered.

Medical Jurisprudence: Examination of the various regulatory mechanisms developed by governmental units to regulate the practice of medicine. Both state and federal systems will be discussed, and the legal and political bases upon which such regulation is promulgated will be reviewed, including police powers and commerce. In substance, the course will cover human investigation, child abuse, the mental health system, experimentation and professional negligence, the role of the physician as expert witness, and will include a clinical adaptation of the physician as expert witness in an actual trial proceeding. (20 hours)

Family Systems in Health and Illness: The goals of this course are to help the student develop knowledge of how general systems theory, communications theory, and family systems theory can be applied to family functioning in health and illness. This includes the disruptive impact of illness on the equilibrium of the family system as well as how illness can sometimes maintain homeostasis in a family system. How a family system functions through time as members enter and leave the system will also be discussed.

Sociology of the Hospital: A variety of topics will be covered in this course but primarily the focus will be upon five issues: what organizational variables influence the quality of patient care; what types of dilemmas arise when one attempts to provide clinical services in bureaucratic system; how do external groups exert social control over hospitals; what is the role of the patient and his/her family in the social structure of the hospital and what changes are occurring (e.g., Patient's Bill of Rights); and finally, how can social and organizational factors that relate to illness and patient care be modified to increase the quality of care provided? Findings from a study that has been conducted here at the Medical Center which pertains to the relations between organizational factors and the quality of care will be discussed when appropriate.

Alternative Health Care Systems: The course will provide an introduction to a variety of alternative medical practices including folk medicine, shamanism, curanderismo, and faith healing. These practices will be examined within the context of supportive cultural attitudes and belief systems about health and healing. In addition, linkages between such practitioners and scientific healers will be examined so that potential areas of interface and conflict can be identified.

Psychosocial Aspects of Childbirth: Childbirth is viewed as a significant transitional event for new parents, activating stressful social and personal issues that can eventuate into severe management problems if not assessed and treated by the clinician. The course will focus on parenthood as a "normal crisis", reviewing key personal and social issues in becoming a parent. Special consideration will be given to the post-partum period and the behavioral and emotional sequelae of childbirth, with emphasis on distinguishing between normative and pathological variations. Principles of care which have successfully reduced the incidence of severe postpartum reactions will be presented and the implications for management discussed.

Illness Behavior: Health service utilization, or why people who experience symptoms seek out medical care, is the basic topic of this course. A variety of topics will be discussed that all pertain to what is known about the often complex interplay of medical, social, and psychological factors that are involved in such decision-making. Such topics will include major conceptual models, research findings, patient compliance, and the pertinence of what is known to medical practice in its varied forms.

Behavior Change Strategies in Medical Practice: Focusing on the doctor-patient relationship, this mini-course considers the psychological tools a physician has available for successful behavior change in patients. Topics to be covered include a model for behavior change, intervention techniques and patient compliance with prescribed regimens. Use of behavior change strategies with cigarette smokers and men with elevated serum cholesterol will be used as examples in applying behavior change strategies.

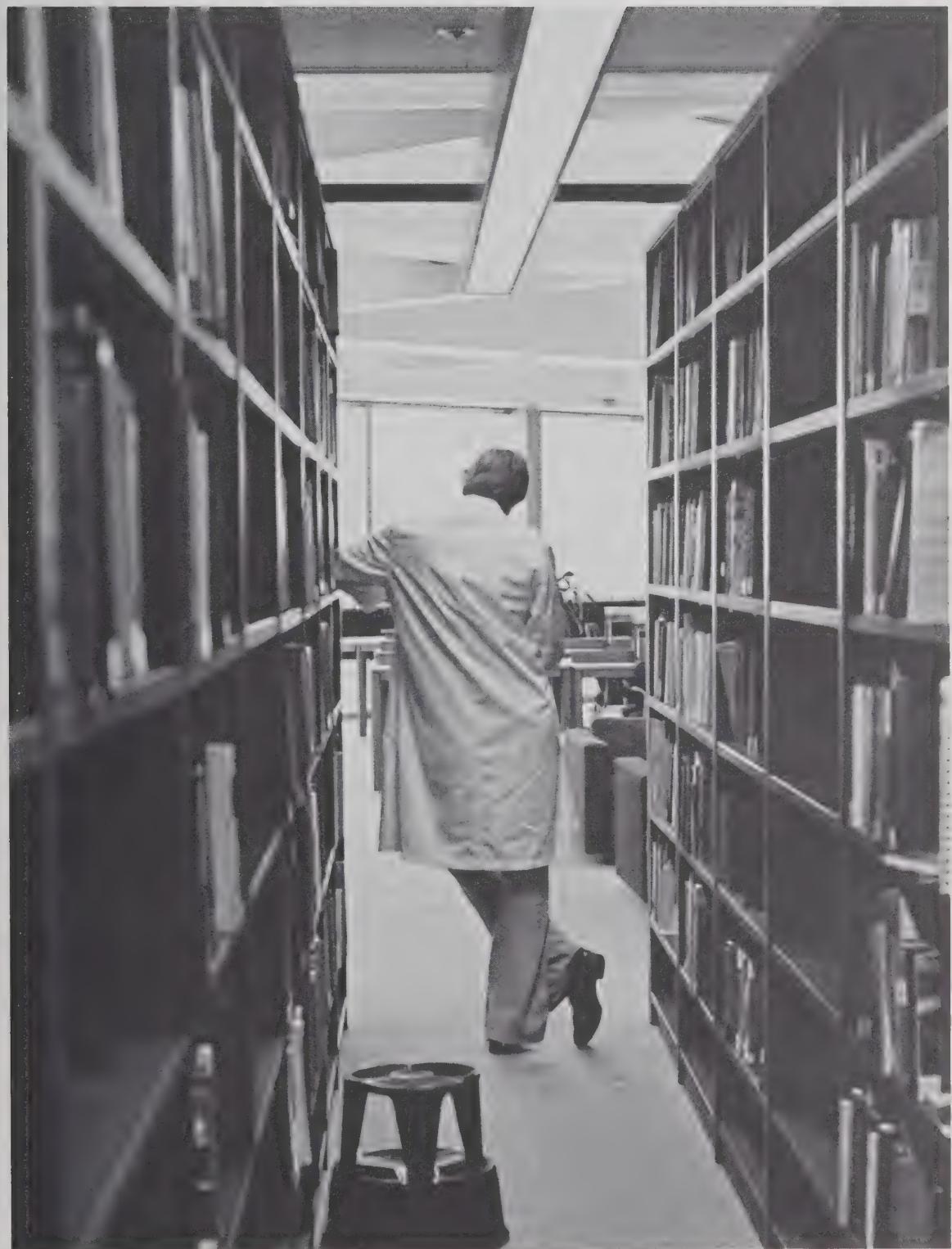
Political Context of American Medicine: We will examine several major areas in which medical practice in the United States is and will be heavily conditioned and regulated by government action. Topics will include: the development of national health insurance, the allocation of health care resources, the management of malpractice claims, the financing of medical education and research, the organized review of professional decisions, and the regulation of human experimentation. These issues (and others which might be identified by students) will be discussed from the legal, ethical, and political perspectives presented by an attorney, a specialist in medical ethics, and a political scientist.

Didactic Life Style Seminar: Using the methods and principles of Individual Psychology including interpretation of early recollections and family constellation, we will explore participants' approach to three contexts of living: society, the other sex, and work, with a focus on occupational concerns and professional expectations. A model for understanding behavior and personality developed by Alfred Adler, M.D., will be demonstrated and applied to data provided by participants to his/her personal style, goals, and aspirations. We will use early recollections and various group techniques to illuminate for each participant the personal meaning of his/her birth order, sibling structure, parental models, and family values. In reviewing formation of the life style and dominant goals, we will bring this information to bear on each participant's approach to a career in the health professions. (20 hours)

Death, Grief, and Loss: This seminar will provide an intensive overview of stages in dying, in terms of the experience of individuals with terminal disease, recognition and identification of stages in the clinical setting, and responsive care on the medical, personal, and social levels. The seminar will consider questions often occurring in care of the dying, such as ethical issues (right to die), personal reactions of patients and care-givers, alternative modes of terminal care, and suicide.

Rural Health Care Delivery: This course will trace the natural history, design, execution and results of a comprehensive biosocial assessment of a poor, black, rural community in Holmes County, Mississippi, which was undertaken for the purpose of developing a baseline for instituting intervention strategies which would have direct application to the community under study. A variety of unique aspects of this program will be under the focus of this seminar, especially the ways in which community people were recruited into the program and how they exerted a considerable amount of local control. The course will be open to eight students and if arrangements can be made, will include a three-day weekend field trip to Holmes County. Students will be selected on a combination of first come, first accepted and personal interview by the course director. The final requirement for completion of the course will be an informal presentation by the student participants to the entire Phase II class based on a critical assessment of the program (and personal experience if possible).

Introduction to Psychotherapy: An introduction to principles and techniques of psychoanalytically based psychotherapy, this course will emphasize the understanding of those aspects of psychotherapy which are particularly relevant to general medical practice. Specific topics include the structure of the personality, the helping relationship, transference and counter-transference, interpretation, insight and therapeutic change.



Human Sexuality and Health Care: This course has two goals. First, to provide an atmosphere and opportunity for the student to broaden his/her general awareness of the multiple levels of sexuality that permeate human existence; second, to instruct the student in various aspects of human sexual function that most commonly emerge, directly or indirectly in medical practice. Through the use of audiovisual aids, small group discussion, and lecture/panel presentations, the course reviews sexual function and dysfunction in relation to health as well as specific medical conditions. The role of the sex history and sex counseling is considered.

Computer Applications in Medicine: Digital computers are progressively expanding their roles in the practice of medicine and in society in general. It is highly probable that within the professional lifetimes of physicians now in training, the use of and interaction with a computer will be a necessary, unavoidable part of medicine. This course will consist of a series of discussions in which a variety of topics will be examined including the basic properties of computers, the strengths and appropriate use of such properties, and current and future clinical applications of computers. The course will *not* teach you how to program, but it will give you, a future computer-user, a well educated layman's understanding of computers.

Biochemistry

BIOCH 301

Basic Biochemistry. A lecture course designed as an intensive introduction to biochemistry. Emphasis on descriptive chemistry of the main classes of biochemical compounds and metabolic processes in the human organism, and changes associated with disease processes. Prerequisite: one year general chemistry, one course organic chemistry. (4-0-4)

BIOCH 401

Clinical Chemistry I. The analytical and biochemical basis of methods used for chemical analysis of body fluids as related to diagnosis and treatment of disease. Topics discussed include blood sugar, carbohydrate tolerance tests, renal function tests, plasma electrolytes, blood gases, proteins, enzymes and cholesterol. Critical evaluation of methods is emphasized. The laboratory includes experiments designed to instruct students in the quantitative analysis of clinically important metabolites. Emphasis is placed on accuracy, quality control and fine technique. Manual methods are stressed, with a variety of methods and instruments used. The student learns to apply error theory and statistics in interpreting and evaluating results. Prerequisite: BIOCH 301. (3-6-5)

BIOCH 421

Clinical Chemistry II. A continuation of Clinical Chemistry I, covering additional tests and topics: lipids, special proteins, chemical hematology, vitamins, biogenic amines, elementary toxicology, liver and thyroid function tests and steroid methods. Principles underlying automated and computer application methods will be discussed. The laboratory section includes experiments in the above areas. Prerequisites: BIOCH 401. (3-6-5)

BIOCH 451

Biochemistry I. The chemistry and metabolism of biologically important compounds, amino acids and proteins; nucleic acids and protein synthesis; bioenergetics biochemical function of enzymes; common pathways of metabolism; carbohydrates and lipid metabolism. Phase I requirement for medical students. (4)

BIOCH 452

Biochemistry II. Continuation of BIOCH 451. The integration of cellular metabolism; regulation of hydrogen ion concentration; the reproduction of the molecular level, including genetic coding and DNA replication, transcription and translation; nucleic acids and disease; hormones; regulation of whole body metabolism; biochemical role of vitamins; calcium and phosphate metabolism. Required for medical students. Prerequisite: BIOCH 451. (4)

BIOCH 501

Advanced Biochemistry I. An advanced lecture course considering enzymology, cell physiology, and the chemistry of the important classes of biological substances, including carbohydrates, lipids, amino acids, proteins, and nucleic acid. Biochemical investigation; chemical thermodynamics; properties of solutions, electrode potentials, chemical kinetics and membrane phenomena. Required of all biochemistry graduate students. (5)

BIOCH 502

Advanced Biochemistry II. An advanced lecture course considering biological oxidations, the pathways of metabolism, the control and regulation of metabolism, nutrition, etc. The chemical nature, biosynthesis, evolution, and mechanism of action of the hormones. Specific topics dealing with the metabolism of proteins, lipids, and carbohydrates; particular attention to recent developments. Required of all graduate students. (5)

BIOCH 503

Advanced Biochemistry III. Structure, physical and chemical properties of polynucleotides and their components; physical and chemical properties and biosynthesis of nucleic acids; transfer and messenger RNA; the role of nucleic acids in protein synthesis. The biochemical structure and function of specialized tissues, including: the liver; muscle, including contraction mechanisms; hemopoietic system; kidney; bone; connective tissue, etc. Required of all graduate students. (5)

BIOCH 521

Biochemistry of Nutrition. Recent developments in the nutritional aspects of carbohydrates, proteins, lipids, and trace nutritional substances. Lectures. Prerequisite: BIOCH 451 and 452. (3)

BIOCH 522

Molecular Biology. The synthesis, function, and interaction of the various macromolecular components of cells, with emphasis on the sequential, residue-by-residue transfer of genetic information. The synthesis and degradation of the extracellular structural macromolecules with emphasis upon their functions and interactions. The influence of extracellular matrices on gene expression in normal development and neoplastic states. (2)

BIOCH 523

Comparative Biochemistry. Comparative study of the metabolic strategies and biochemical structures selected by various phyla to carry fundamental biochemical functions. (3)

BIOCH 531

Neurochemistry. Selected topics and recent developments concerning chemical events related to brain function. (3)

BIOCH 532

Laboratory in Neurochemistry. Laboratory and conferences. Experiments concerned with brain cellular structure and membranes, enzyme activities, lipids and neurotransmitters, which, would familiarize the student with techniques useful in neurochemical research such as ultracentrifugation, gas chromatography, electrophoresis, fluorimetry and others. Prerequisite: BIOCH 531 or consent of instructor. (2)

BIOCH 581

Biological Research Techniques. Discussion and laboratory work surveying and illustrating the practical aspects of biochemical methodology and instrumentation; techniques for the isolation, analysis, and characterization of biologically important substances; the fundamental principles of radioisotope techniques, enzyme assay. Required of all biochemistry graduate students. Prerequisite: BIOCH 502. (4)

BIOCH 590

Special Topics in Biochemistry. An advanced course dealing with selected topics in Biochemistry. The particular subjects vary from year to year. One to three topics are considered each time the course is given. Topics include: Biochemical genetics; Chemistry of enzymes; Phytochemistry. Lectures. Prerequisite: BIOCH 503. (3)

BIOCH 595

Seminar and Journal Club. Student and faculty presentation of assigned subjects of current importance in biological chemistry and related fields. Assigned reading. Required of all biochemistry graduate students. (1)

BIOCH 598

Research in Biological Chemistry. Research on problems of biological importance with members of the graduate staff. Required for a M.S. or Ph.D. Degree. Variable Credit.

BIOCH 602

Biochemistry of Disease. The alterations of metabolic pathways in various organs and tissue compartments are studied in relation to organ, metabolic, and genetic pathology. The biochemical derangements are illustrated with case demonstrations. Topics are selected and discussed in depth with emphasis on current research work. The facilities of the Clinical Chemistry laboratory are available to illustrate biochemical changes and their significance. Prerequisite: BIOCH 503. (2)

BIOCH 611

Clinical Chemistry I. Basic aspects of clinical chemistry including general laboratory procedures, collection, and handling of specimen, statistics, quality control, automation, normal values. Includes lectures on liquid chemistry, metabolism and methodology. The chemistry and methodology used for the identification and quantitation of biological compounds such as carbohydrates, proteins and amino acids, hemoglobin and its derivatives, porphyrins and related compounds. This includes chemical structure, physiological role, intermediary metabolism, normal values, and clinical applications. Required of Clinical Biochemistry Majors. Prerequisite: BIOCH 503. (4)



BIOCH 612

Clinical Chemistry II. Discussions cover the clinical significance, chemistry, and assay methods of biological substances relevant to the areas of toxicology and endocrinology. Toxicology lectures cover types of toxic substances presently assayed in clinical chemistry laboratories, i.e., volatile substances, metals, and nonmetals, and nonvolatile organic substances including various drugs. In endocrinology, lectures deal with the nature and actions of steroid and protein hormones and methods employed for identification and quantitation. Thyroid function tests are also discussed with emphasis placed on new methodology.

Mechanisms and action of enzymes of diagnostic interest including those associated with pancreatic function. Factors governing enzyme reactions and enzyme kinetics in relation to the assays of enzyme activities are reviewed. The chemistry, methodology, and clinical application of enzyme systems presently assayed in clinical chemistry laboratories are discussed individually. Also included are demonstrations and discussions of the instrumentation for enzyme assays. Required of Clinical Biochemistry Majors. Prerequisite: BIOCH 503. (4)

BIOCH 613-614

Clinical Chemistry Laboratory I, II. Offered concurrently with Clinical Chemistry I and II. The qualitative and/or quantitative analysis of biological compounds of clinical interest are discussed. The graduate students rotate through the various sections of the chemistry laboratory. Instruction and guidance are provided to permit the student to perform the individual assays in order to become familiar with the techniques and instrumentation. Required of Clinical Biochemistry Majors. (6)

BIOCH 621

Laboratory Management and Supervision. This course discusses human problems in management and organization, group dynamics, decision-making, policy formulation, and organizational objectives, and restraints. Required of Clinical Biochemistry Majors. (2)

BIOCH 622

Automation and Instrumentation in Clinical Chemistry. Basic principles of the common laboratory instruments. The meaning of automation and mechanization in today's Clinical Biochemistry Laboratory. Included are instruments such as spectrophotometers, pH meters, fluorometers, nephelometers, flame photometers, and flow-through discrete sample, and centrifugal analyzers. Current trends in automation and instrumentation are reviewed. (2)

BIOCH 623

Science and the Law. Scientific problems encountered by the legal profession are discussed. Includes patents, products liability, medical malpractice, environmental law, and food and drug law. (2)

BIOCH 690

Special Topics in Clinical Chemistry. The course will be devoted to the consideration of the more modern techniques for the determination of various constituents of physiological fluids and their significance. Topics of special interest to clinical chemists and other clinical laboratory personnel are discussed. Special emphasis is placed on recent developments in instrumentation and methodology and their clinical application. Studies based upon fundamental biochemistry and concurrent theories in the literature: the nature and variations, in health and disease, of serum proteins and serum enzymes; electrophoresis; use of enzymes as diagnostic reagents; the role of computers in Clinical Biochemistry; and reading assignments presented and discussed. On occasion, experts in particular areas of Clinical Biochemistry are invited to conduct seminars. Graduate students are required to prepare and conduct at least one seminar session. Required of Clinical Biochemistry Majors. (1)

BIOCH 699

Thesis Research. Post candidacy. Variable credit.

Genetics**GENET 451**

Genetics. The general introduction to genetics includes cytogenetics, chromosomal mechanics, transmission genetics, population genetics, and the physiological and biochemical aspects of genetics. The student is also introduced to the problems of treatment and genetic counseling. Lectures and seminars are accompanied by laboratory demonstrations and laboratory exercises. Required by Phase I medical students. (31 hours)

Health Care Administration

HCADM 301

Health Care Management. Organizational design and managerial processes of planning, organizing, directing and controlling, as well as the dynamics of managerial jobs, are studied. Emphasis is on management strategies and techniques in the area of health care delivery. (3-0-3)

HCADM 312

Supervisory Management. The supervisor as manager functioning in an environment of legal and social change. Basic managerial concepts are covered as they apply to a health care setting. Fair Employment Practices, health and safety, unions, training and other managerial topics are discussed. (2-0-2)

HCADM 321

Principles and Theories of Food Service Management. Introduction to the managerial processes of planning, organizing, directing, monitoring and evaluating an enterprise. Techniques in management of human, material and financial resources in the context of a food service operation. Practical experience in a food service setting is provided. (3-3-4)

HCADM 452

Contemporary Analysis of the Health Science Professions. A seminar, study-group approach to selected contemporary issues in the health professions. (The selection of issues will change from time to time as high-intensity trends develop or as student needs develop.) The issues selected will range across elements of the social, ethical, legal-legislative, economic, and historical roots of the health professions. Senior or graduate standing. (2-0-2)

HCADM 524

Health Care Environment—An Organizational Perspective. Introduction to various theories of organization behavior and their relevance to management of clinical and patient care processes. Special emphasis is on problems related to implementing change in the health environment at both the corporate and unit levels in the organization. Focus includes use of control systems to monitor the progress or stagnation of an institution. Limited enrollment. (4-0-4)

Health Care Systems

HCSYS 302

Dynamics of Health Care. An overview of the various contributions representative members of the health team make to the delivery of health care. Component topics include professionalism, ethics, licensure, organizational structure of hospitals and other medical facilities. Medicare/Medicaid and medical-legal considerations. (2-0-2)

HCSYS 521

Systems of Health Care. Seminar course in the study of the health care delivery system in the U.S. Particular emphasis on identifying historical forces which have shaped the current system for health care; the organization of the hospital and the medical center; current manpower roles in health care; and the current issues that face the health system today. Discussion will also focus on external forces and controls that substantially affect the health care system. Students will be expected to write a research paper and present it orally to the class. (2-0-2)

Health Care Education

HLCED 451

Perspectives in Clinical Teaching. Seminar in teaching strategies, including theoretical basis, mode of presentation, and application in clinical settings. Exploration of contemporary educational issues and models and their implications for the practitioner/teacher. Emphasis is on creation of innovative and flexible teaching styles in various clinical areas. (4-0-4)

HLCED 454

Development of Instructional Media. The media as arts of communication. A survey of communication theory and its relationship to the communication process. Utilizing various instructional media, students design a program of instruction relating to some aspects of the health professions. (2-0-2)

HLCED 461

Educational Diagnosis. The purpose is to sensitize future practitioners to three major psychological characteristics which are important to learning and instruction, and which vary from person to person. Topics include: Degrees of Freedom in Learning; Language Code in Learning; Modes for Representing Concepts; Diagnostic Procedures; Applications. (4-0-4)

HLCED 583

Clinical Investigation I. A seminar course based on the philosophy of science. The central aim of the course is to provide a basis for the utilization of the methods of science in professional practice. Content includes introductory statistics, research methodology, and ethical and legal considerations in clinical research. Prerequisite: Introductory Statistics. (2-0-2)

HLCED 584

Clinical Investigation II. A continuation of HLCED 583 Clinical Investigation I. (2-0-2)

Health and Society**HLSOC 454**

Health in the Developing Nations. A recognition that all nations are in a stage of development. Special emphasis will be placed on the problems and resources which affect health care in the less developed nations. (2-0-2)

HLSOC 461

Culture, Race, Poverty, and Health Care. Through selected, identified readings on race, values, stereotypes, frames of reference, poverty, and health care delivery using *Learning Through Discussion* as a model for discussion, the student will have the opportunity to develop critical thinking in the area of race, poverty, and health care, and apply it to nursing care. (2 or 3 cr.)

Immunology**IMMUN 301**

Basic Immunology. An introduction to the basic concepts and terminology of immunity including development, structure and function of the lymphoid systems, the basis of antigenicity, antibody structure, methods of detection and measurement, mechanisms of cellular immunity, white cell function, hypersensitivity reactions, the complement system, and mechanisms of immune suppression and tolerance. (3-0-3)

IMMUN 402

Clinical Immunology. Clinical and applied immunology as it relates to immunologic processes in various disease states. The use of immunology as a diagnostic, prognostic and therapeutic aid is studied. The laboratory section of the course covers basic techniques of agglutination, cellular separation and assay methods. Prerequisite: IMMUN 301. (2-0-2)

IMMUN 403

Clinical Serology. A laboratory course on the basic techniques employed in the serological laboratory. Lectures on test principles and practice performing these tests will be covered.

IMMUN 421

Immunohematology. Blood group antigens and antibodies from the discoveries of Landsteiner in 1900 to the present day. Blood banking procedures involved in drawing, testing, storing and transfusing whole blood and its components are discussed. The laboratory section of this course will deal with the basic blood bank procedures including ABO grouping, Rh typing, compatibility testing and special antibody studies. Prerequisite: IMMUN 301. (2-6-3)

IMMUN 451

Immunology. An introduction to the field, with a stress on basic concepts and principles, which will prepare students for clinical applications in Phases II and III of Rush Medical College. Topics include: antibody structure; antigen-antibody reactions; genetic and cellular control of antibody synthesis; the complement system; phagocytosis; inflammation and nonspecific immunity; immediate and delayed hypersensitivity; cellular immunity; transplantation immunology and immunogenetics; and tumor immunology. In addition, a three hour optional demonstration laboratory is presented in which the student can familiarize himself with the procedures used in the clinical immunology laboratory. (27 hours)

IMMUN 501

Fundamentals of Immunology. An introductory course of lectures and tutorials; a historical background in Immunology; the structure and development of the lymphoid system; antigen-antibody interactions; the biology of lymphocytes. Variable credit.

IMMUN 502

Basic Immunochemistry. Structure of immunoglobulins; hapten-antibody reactions; the antibody combining site; complement; antibody heterogeneity. Variable credit.

IMMUN 503

Principles of Cellular Immunology. T and B lymphocytes; cell cooperation in the immune response; lymphocyte receptors; tolerance. Variable credit

IMMUN 504

Biology of the Lymphocyte Membrane. Structure and composition of cell membranes; fluid-mosaic model; properties of the cytoskeleton; receptor redistribution; antigen receptors and cell recognition; histocompatibility antigens. Prerequisite: IMMUN 502, 503 or equivalent. Variable credit.

IMMUN 505

Complement. Components of the classical pathway; alternative pathways; lysis of cell membranes; complement deficiencies; genetics of the complement system; regulation and control. Prerequisite: IMMUN 502 or equivalent. Variable credit.

IMMUN 506

Phagocytosis and Host-Parasite Relationships. Mononuclear phagocytes; polymorphonuclear leukocytes; the nature of lysosomes; mechanisms of chemotaxis, phagocytosis and intracellular digestion; metabolic pathways in phagocytes; role of the phagocyte in disease. Variable credit.

IMMUN 507

Ontogeny and Phylogeny of Immunity. Phylogeny of the lymphoid system; evolution of the immunoglobulins; immune mechanisms in invertebrates; ontogeny of the lymphoid system. Prerequisite: IMMUN 501, 502, 503. Variable credit.

IMMUN 508

Introduction to Immunogenetics. Allotypes; blood group substances; histocompatibility antigens; immune response genes; the major histocompatibility complex; genetics of the H-2 and HLA systems. Prerequisite: IMMUN 501, 504. Variable credit.

IMMUN 509

Tumor and Transplantation of Immunology. A tutorial course, supplemented by extensive reading lists. Introducing the immunology of malignancy and tumor biology; allograft rejection and graft-vs-host reactions; immune surveillance and alloaggression. Prerequisite: IMMUN 501, 503, 508. Variable credit.

IMMUN 511

Hypersensitivity and Immunological Mediators. A tutorial course describing the biochemical and cellular mechanisms of hypersensitivity reactions. Prerequisite: IMMUN 501, 503, 508. Variable credit.

IMMUN 514, 614

Clinical Laboratory Immunology. A two-year program of practical and theoretical experience in all aspects of clinical laboratory immunology and immunodiagnosis. Variable credit.

IMMUN 541

Clinical Immunology. The course emphasizes the role of the immune system and the immune processes in health and disease. The course further introduces the student to diseases in which the immune system plays a major role. These include autoimmune diseases, drug hypersensitivity, anaphylaxis, and allergic diseases, transplantation and tumor immunology, and immune deficiency syndromes involving B and/or T lymphocytes, complement, or neutrophils, same as Rush Medical College PPHYS 541. (13 hours)

IMMUN 581

Immunological Research Techniques and Instrumentation. A program of laboratory experience for first year students in several faculty laboratories, concurrently with lecture/discussion groups on theoretical aspects of laboratory methods. Introduction to the physical biochemistry of macromolecules; preparation of antigens and antibodies, and their detection; chromatography, electrophoresis, analytical and preparative ultracentrifugation; spectrophotometry and fluorimetry; light, fluorescence and electron microscopy; tissue culture methods; detection and enumeration of lymphocytes and antibody-forming cells. Demonstration of research instrumentation facilities. Variable credit.

IMMUN 590, 690

General Topics. Tutorial programs supplemented by general reading lists and paper presentation designed to maintain and develop a general understanding of Immunology. Variable credit.

IMMUN 592, 692

Advanced Topics of Immunology. Tutorial programs supplemented by general reading lists paper presentations and essays concerning the areas of Immunology specified by the instructor. This program is aimed at involving the students in the specialty of the various faculty members, and at the development of literary and critical skills in the expression and interpretation of scientific information. Variable credit.

IMMUN 601

Clinical and Experimental Immunology. The primary emphasis is on clinical and experimental immunology through patient evaluation, laboratory problems and/or introduction to the clinical immunology laboratory. With the aid of seminar discussion preceptors, laboratory strategy, concept and methodology is used to study individual problems. Individual research projects are available under the direction of the departmental staff. Elective, 10 weeks for Phase III medical students.

IMMUN 621

Cellular Immunology and Immunogenetics. Advanced tutorial. Variable credit.

IMMUN 622

Medical Immunology. Advanced tutorial. Variable credit.

IMMUN 623

Immunopathology. Advanced tutorial. Variable credit.

IMMUN 699

Thesis Research. Variable credit.

Internal Medicine**MED 301**

Hematology I. Study of normal hematopoiesis including development, metabolism and function of red cells, white cells and platelets and an introduction to the various associated hematologic disorders. Includes laboratory experiences dealing with basic routine tests performed in a clinical hematology laboratory, such as manual and simple automated cell counting, hemoglobin and hematocrit determination and differential counting with emphasis on normal cells. (3-6-5)

MED 401

Body Fluid Analysis. Analyses of various body fluids with emphasis on the theory and practice of clinical procedures. Component topics will include the analysis of urine, gastric juice, cerebral spinal fluid, feces, semen, transudates and exudates. (3-3-4)

MED 425

Hematology II. Same as PPHYS 525. Includes review of normal hematopoiesis and an in-depth study of the various hematologic disorders, their causes, clinical features, and significant related laboratory data and treatment. Prerequisite: MED 301. (4-0-4)

MED 435

Advanced Morphology. In-depth study of abnormal cell morphology in the bone marrow and peripheral blood and its relationship to various hematologic disorders. Also includes the performance of the more specialized hematologic techniques such as osmotic fragility, special stains. Corequisite: MED 425. (0-6-2)

Medical Physics**MEDPH 311**

Medical Physics I. Basic physical principles applied to medical science, particularly to the function of the human body. Includes body mechanisms; strength of material and level systems; sound and process of hearing; thermal dynamics and the body; light optics and visions; electricity and the body; radiation and the body. (4-0-4)

MEDPH 321

Medical Physics II. Application of the principles of optics, electricity, radiation, electronics to laboratory instrumentation. Prerequisite: MEDPH 311 or equivalent. (3-3-4)

Medical Technology**MEDTK 301**

Basic Laboratory Skills. Study and practice of basic laboratory skills used in the various clinical laboratory areas. Topics covered include Instrumentation, proper use and maintenance; Manual skills such as pipetting, titrating and venipuncture; Preparation and standardization of reagents; Laboratory calculations. (1-9-4)

MEDTK 302

Patient Care Techniques. Clinical experience in the hospital patient care areas. Includes blood collection, specimen handling and processing procedures as well as interaction with patients and professional staff of the hospital. (0-4-1)



MEDTK 421

Practicum in Clinical Chemistry. Rotation through the hospital Clinical Biochemistry laboratories. Application of basic skills learned in student chemistry laboratory, instrumentation and advanced methodologies are dealt with. (0-18-6)

MEDTK 422

Practicum in Hematology. Rotation through the hospital Clinical Hematology laboratories. Application of basic skills learned in student laboratory, instrumentation and advanced methodologies are dealt with. Radiohematology, bone marrow techniques and coagulation are included. (0-18-6)

MEDTK 423

Practicum in Immunology. Rotation through the hospital Clinical Immunology laboratory. Application of basic skills learned in student laboratory, instrumentation and advanced methodologies are dealt with. (0-9-3)

MEDTK 424

Practicum in Microbiology. Rotation through the hospital Clinical Microbiology laboratories. Application of basic skills learned in student laboratory, instrumentation and advanced methodologies are dealt with. (0-18-6)

MEDTK 425

Practicum in Immunohematology. Rotation through the hospital Blood Bank laboratory. Application of basic skills learned in student laboratory, instrumentation and advanced methodologies are dealt with. (0-9-3)

MEDTK 441

Seminar in Medical Technology. Discussion of current topics in medical technology and associated fields. Students present abstracts. (2-0-2)

Microbiology**MICRO 311**

Diagnostic Bacteriology. Special emphasis on diagnostic procedures employed in the Clinical Bacteriology Laboratory such as specimen collection, isolation and identification of medically important bacteria, antibiotic sensitivity testing and determination of serum antibiotic levels. Includes laboratory exercises associated with these various concepts. Development of proficient skills in these various techniques is stressed. (3-6-5)

MICRO 411

Parasitology, Mycology and Virology. This course provides clinical background in mycology, parasitology and virology. Emphasis is on the disease involved and diagnostic procedures used in the laboratory. The laboratory portion consists of identification, specimen collection and processing of medically important viruses, fungi and parasites. Prerequisites: MICRO 311. (3-6-5)

MICRO 451

Microbiology Concepts. The course is designed to acquaint the students with the basic morphological and physiological characteristics of infectious agents. Emphasis is placed on organisms of importance in human disease. General classification of infectious agents, the mechanisms by which these organisms contribute to disease states, and laboratory identification are emphasized. Demonstrations and laboratory work accompany the lecture portion of the course. Required for Phase I Medical students. 50 hours

MICRO 501

Clinical Microbiology. Specimen collection, organism isolation and identification, and interpretation of serology are studied. Infections of various organ systems are covered as a lecture-seminar series and by assignment of pertinent readings. Elective, alternate years by arrangement. Prerequisite: MICRO 451 or equivalent. (3)

MICRO 502

Viral Oncology. This course offers a comprehensive review of biologic, immunologic, and molecular properties of animal and putative human oncogenic viruses. Techniques employed for investigating the role of viruses in neoplasia are reviewed. Elective, alternate years by arrangement. Prerequisite: MICRO 451 or equivalent. (3)

MICRO 503

Animal Models of Human Diseases. Natural and experimental diseases of animals are compared with similar diseases in man. Models of selected infectious, immunological, degenerative, metabolic and neoplastic diseases are presented as a lecture-seminar with bibliographies provided for each model system. Elective, alternate years by arrangement. (2)

MICRO 601

Clinical Bacteriology. The experience provides rotation in each section of the diagnostic bacteriology laboratory with emphasis on laboratory identification of pathogenic bacteria and normal flora. Experience is also provided in the techniques applicable to office diagnostic bacteriology. Clinical work is provided by arrangement with the Infectious Disease Section. Specimens from patients on the Infectious Disease service provide data for learning clinical microbiology. Laboratory projects are available for students wishing to pursue individual interests. Elective, duration variable for Phase III medical students.

MICRO 602

Diagnostic Virology. Specimen collection, virus isolation and identification, and the interpretation of virus serology are studied. Laboratory work involves isolation, identification, and serological techniques of the diagnostic virology laboratory. By arrangement with the Infectious Disease Section, students select cases to be studied in parallel with the laboratory. Elective, duration variable. Prerequisite: MICRO 451.

Nutrition**NUTRI 406**

Human Nutrition. This course is to provide the student with a more in-depth background in nutritional concepts which integrates the sciences of biochemistry and physiology. (4)

NUTRI 410

Seminar and Practicum of Nutrition During the Life Cycle. This course will involve the application of the principles discussed in NUTRI 412 to a clinical setting. The student will be able to observe and participate in many problem-solving experiences that are related to nutritional intervention. (3)

NUTRI 411

Seminar and Practicum in Nutritional Care I. Students apply nutritional knowledge in a clinical setting. Students must understand the pathophysiology that accompanies disease and be able to integrate this knowledge in applying nutritional care. (4)

NUTRI 412

Seminar & Practicum in Nutritional Care II. A continuation of NUTRI 411. (4)

NUTRI 421

Nutrition during the Life Cycle. Provides educational and clinical skills which will enable the student to integrate the role of nutrition in meeting the needs of an individual in health and disease. The course will be divided into four parts: cultural, social, and psychological influences on food habits, food needs and costs, nutrition and health, and nutrition in clinical care. (3)

NUTRI 431

Nutrition in Health Care I. A study of nutritional status as applied to pathophysiology is emphasized in this course. Students will learn the rationale for diet modification in prevention and therapeutic nutritional care. Corequisite: NUTRI 411. (4)

NUTRI 432

Nutrition in Health Care II. A continuation of NUTRI 431. Corequisite: NUTRI 412. (4)

NUTRI 451

Nutrition. This course has been designed to interrelate the science of nutrition to clinical medical/nutrition situations. Using the developmental approach, this course includes not only the composition of food and ecology of nutrition, but attempts to look at health and disease in light of nutritional and metabolic processes at the cellular level and the consequences of these processes on other organ systems and the entire organism. Case studies, audiovisual aids and learning experiences will be used to supplement the lectures. Required by Phase I medical students. (15 hours)

NUTRI 455

Ecology of Nutrition. The sociological, psychological, economic, political, and cultural factors which affect the intake of required nutrients observed on a global basis. Ecological imbalance, nutritional diseases, and their long-term ramifications on the individual and his world are studied in detail. (3)

NUTRI 461

Nutrition, Growth and Development. Examination of the development of metabolic and physiologic functions with primary consideration of mechanisms for the regulation of these events. The role of diet in these processes and in the determination of later functional capability is emphasized. (4)

NUTRI 465

Ecology of Malnutrition in Urban Industrial Populations. The epidemiologic approach to the study of malnutrition. Poverty, its broad meaning and implications. Social and psychological correlates of malnutrition. (3)

NUTRI 466

Advanced Human Nutrition. An in-depth study in advanced nutritional concepts which integrates the sciences of biochemistry and physiology. (4)

NUTRI 501

Nutritional Interrelationships I. A study of the dynamic interaction between the animal and its environment, particularly the diet. Chemical and metabolic phenomena involved in the development and maintenance of the mammalian organism. Regulation as a means of adaptation. Emphasis on understanding requirements for specific nutrients in individuals and populations, evaluation of food intakes and dietary habits, and on nutritional needs during pregnancy and lactation, growth and maturation, and disease. (2)

NUTRI 502

Nutritional Interrelationships II. Continuation of NUTRI 501. (2)

NUTRI 523

Assessment of Nutritional Status. Identification of the best methods of collecting, recording and analyzing physical signs, biochemical and anthropometric data, and diet intake. Assessment of the nutritional status and writing of diet and educational plans for clients. Prerequisite: One course in Nutrition, Biochemistry, Physiology or permission of instructor. (3-0-3)

NUTRI 531

Nutritional Self Study. Students assess their own food intakes, dietary habits and nutritional needs by consuming a diet which they might design for a patient. (1)

NUTRI 541, 542, 543

Practicum I, II, III. Clinical practice in implementing and evaluating nutritional care. (1)

NUTRI 544

Practicum IV. Discussion of student-presented cases and clinical care conferences. In addition, for 18 to 20 hours of clinical practice per week, the student has responsibility for assessment, planning, implementing and evaluating nutritional care. (6)

NUTRI 555

Ecology of Nutrition. Same as NUTRI 455. Reserved for Clinical Nutrition students. Students prepare lectures and assist in presentations for NUTRI 455. (4)

NUTRI 561

Special Topics in Nutrition. Series of in-depth seminars covering topics of interest not completely covered in other courses. Example: Total Parenteral Nutrition. (2)

NUTRI 565, 566, 567

Seminar in Nutrition I, II, III. Student presentations of recent literature. Speakers and guests. Students must register for three quarters. (1)

NUTRI 591

Independent Clinical Study. Intensive clinical nutrition study on a subject in a setting agreed upon by the student and advisor. Prerequisite: HLCED 584. (2-5)

NUTRI 599

Independent Reading. Student contracts with a preceptor for independent academic study of a selected topic in nutrition. (2-5)

Pharmacology**PHARM 301**

Introductory Pharmacology. The course emphasizes the physical and chemical factors governing drug-receptor interaction, importance of quantitative aspects of absorption, distribution, biotransformation and elimination. Representatives of specific classes of drugs affecting autonomic nervous system are studied to familiarize students with the major kinds of drug actions. Designed for third year nursing students. (2-0-2)

PHARM 501

Pharmacology I. The general aspects of the physicochemical factors governing drug receptor interactions, importance of quantitative aspects of absorption, distribution, and biotransformation and excretion of drugs are studied. The probable mode of drug actions that modify biological function and representatives of special classes of drugs are studied to acquaint the student with the major classes of drugs. Laboratories and demonstrations extend the material in the lectures and offer the student practical experience with drug effects in the living organism. Small group discussions correlate lectures, laboratory exercises, and current therapeutic applications. Required by Phase I medical students. (60 hours)

PHARM 502

Pharmacology II. A continuation of PHARM 501. (60 hours)

Physiology**PHYSO 451**

Physiology I. Comprehensive medical physiology course covering all of the major organ systems. A conceptual approach to understanding of physiological functions is developed. Emphasis is placed on utilization of facts in problem-solving. Fall. (5)

PHYSO 452

Physiology II. Continuation of PHYSO 451. Winter. (5)

PHYSO 502

Introductory Membrane Biophysics. Study of fundamental processes involved in movement of ions across membranes; excitability in nerve and muscle; equivalent circuit analysis; artificial membrane systems; structure of membranes; active transport processes. Fall. (4)

PHYSO 503

Physiology of Striated Muscle. Fundamentals of excitation - contraction coupling; mechanics of muscle; equivalent circuit analysis; muscle biochemistry; developmental aspects of nerve and muscle. Fall. (4)

PHYSO 504

Neurophysiology. A conceptual approach to the understanding of central nervous system function. Discussion includes normal function and selected areas of pathology and current research. A one hour student presentation is required. (2-0-2)

PHYSO 511

Nutritional Physiology I. Discussion of particular physiological systems with relation to principles of nutrition. (4)

PHYSO 512

Nutritional Physiology II. Continuation of PHYSO 511. (4)

PHYSO 513

Cardiovascular Physiology. Students will read and discuss the original papers which form the foundations for our current understanding of heart function and control, peripheral vascular control, and transcapillary exchange. The works will be evaluated both in terms of their significance at the time and their present relevance. Winter. (4)

PHYSO 514

Functional Neurophysiology. The course will deal with physiology of neurons and glia; synaptic processes; sensory receptor physiology; spinal cord; cerebellum and motor control; peripheral mechanisms in sensory systems; higher functions of the nervous system. Relevant neuroanatomical concepts will be included. Winter. (4)

PHYSO 521

Cell Structure and Function. Current concepts of the structure and function of various cell organelles; higtochemistry; introduction to techniques of electron microscopy. Alternate years by arrangement. (4)

PHYSO 523

Circuit Theory and Practical Design. A tutorial laboratory course designed to acquaint the student with the principles of design and construction of various electronic equipment commonly encountered in modern physiology. By arrangement. (4)

PHYSO 524

Linear Differential Equations and Transform Methods. First and higher order linear equation; linear algebra techniques; finite difference equations; Fourier series and transforms; Laplace transforms; applications to solution of differential equations. Alternate years by arrangement. (4)

PHYSO 525

Linear Systems Analysis. Block diagrams; feedback; frequency domain analysis; noise and its analysis; partial differential equations and their solution. Alternate years by arrangement. (4)

PHYSO 526

Control in Physiological Systems. Control theory; the human motor system; feedback interactions in the human motor system. Alternate years by arrangement. (4)

PHYSO 598

Introduction to Research. A tutorial course designed to familiarize students with the literature and techniques applicable to modern physiological research. Variable credit.

PHYSO 641

Molecular Mechanisms in Control of Ion Permeability. Advanced course dealing with special topics in the molecular control of excitability; laboratory instruction in voltage clamp techniques. Alternate years by arrangement. Prerequisite: PHYSO 501. (4)

PHYSO 651

Advanced Topics in Muscle Physiology. Equivalent circuit of skeletal muscle; problems in excitation-contraction coupling; molecular events in the generation of mechanical force. Alternate years by arrangement. (4)

PHYSO 652

Active Transport Processes. A detailed study of the physiological and biochemical processes involved in the energy-dependent translocation of solutes across cell membranes. Alternate years by arrangement. (4)

PHYSO 653

Problems in Synaptic Physiology. A detailed review of current experimental and theoretical problems in transmitter release and activation of post-synaptic receptors. Alternate years by arrangement. (4)

PHYSO 654

Selected Topics in Cardiovascular Physiology. Current papers in active research areas of cardiovascular physiology will be read and discussed. Exact topics will vary with specific student and faculty interest, but may include: blood flow dynamics, vascular wall dynamics, exchange and control in the microcirculation, exercise physiology, modeling of the cardiovascular system, etc. Alternate years by arrangement. (4)

PHYSO 655

Topics in Visual Physiology. An advanced tutorial covering current problems in the function of visual receptors and processing of visual information. Alternate years by arrangement. (4)

PHYSO 699

Thesis Research. Postcandidacy research by arrangement with staff. Variable credit.

Pathophysiology**PPHYS 576**

Nutritional Pathophysiology I. The pathophysiology and medical management of disorders related to nutrition and the nutritional status of human beings. Corequisite: PHYSO 511 (2)

PPHYS 577

Nutritional Pathophysiology II. A continuation of PPHYS 576. (3)

Religion and Health**RElh 501**

The Art of Healing. An 11-week, intensive clinical course focusing on the interpersonal dimensions of the healing process; an appreciation of the patient as a total being; an exploration of the anxieties and inhibitions generated in relating to the sick; specialized communication skills, seeing the patient as a partner in the healing task; assisting the student to discover and use his own uniqueness in relating therapeutically to the sick.

Note: Students may be accepted for this course from any discipline or field of study. The descriptions of seminars which follow are built upon the experience of teaching the course for theological students. However, no difficulty is inherent in incorporating non-theological students into the course.

Prerequisite: For theological students at least one year of graduate theological education and an interview with one of the faculty of the Department of Religion and Health. For non-theological students an interview with one of the faculty of the Department of Religion and Health. (16)

RE LH 611

Clinical Case Conference. Clinical seminar using verbatim written materials or tape recordings of actual patient visits by students. One student presents material each seminar period; all students present in a sequence which they construct. Verbatim materials are circulated to seminar members in advance of the seminar to allow careful preliminary study.

The supervisor and the seminar members engage the presenting student in an examination of his ministry. Together they explore the student's understanding of the patient's communication, the student's assessment of the patient's pastoral needs, the student's attempt to carry out an appropriate ministry, the student's ability to use his/her own faith meaningfully in his/her ministry, and the meaning of the student's subjective response to patients. Variable credit.

RE LH 615

Sermon Preparation and Delivery. Students prepare a sermon manuscript and give the sermon in the hospital chapel with their seminar group as the audience. Seminar then relocates and the preaching experience is examined in terms of its appropriateness to the hospital congregation, its articulation of the faith, its witness to the faith and development of the student, and its effectiveness as interpersonal communication. Usually these sermons are amended and given during a Sunday worship service in the hospital chapel. Variable credit.

RE LH 621

Personal and Professional Concerns. This seminar gives students the opportunity to report spontaneously on critical events and issues in their hospital ministry, to examine issues of personal or professional identity, to examine problems in communicating or functioning within the seminar group, to explore the meaning and context of their ministry, their relations with other medical center disciplines, their ability to think theologically about their experience, to examine individual problems of functioning effectively in the pastoral role, and to assist students in evaluating their progress in training. Variable credit.

RE LH 623

Didactic Presentations. Presentations are made by professionals in other disciplines, by supervisory staff, and by students themselves in an attempt to bring theoretical material to bear on the practical work of ministry and to assist the student in clarifying his operational concepts.

From time to time the Didactic Presentations are more structured to cover various important topics. Some subjects which have been presented in the past or which will be covered in coming quarters include:

Suffering: Its Importance for Health. This seminar explores the various philosophical and theological responses to suffering and their expression among hospital patients. The implications of the different responses to suffering for healing are explored.

Aging, Faith and Health. A brief survey of the important biological, psychological, and social changes which accompany aging sets the background for an exploration of the role of faith in the life of older persons, and particularly in their adjusting to and coping with illness.

Faith as a Factor in Health. A brief survey of the major theories of disease and health, scientific and unscientific, Western and non-Western, forms the background for a review of the literature on the role of faith, trust and hope in recovery from illness. Case examples from student's experience are also reviewed. Variable credit

RE LH 650

Individual Supervision. Supervisor and student together develop an individualized contract for learning. The student is enlisted as a partner in the learning process by helping him/her identify his goals, plan for his/her learning, and evaluate his/her progress. Written records of pastoral work are examined in detail as well as written and oral attempts of the student to understand and incorporate the values from the total program experience and to synthesize the clinical, theological, and theoretical data encountered. Supervision of the student on the floor while seeing patients is also provided. Variable credit.

RE LH 681

Guided Study or Research. Each student is expected to undertake a reading or research program which is complementary to his/her learning goals and/or remedial in terms of gaps in basic preparation for understanding pastoral care. Supervisor is consultant to the student for the study program. Note: Expected of year-long students only. Variable credit.

RE LH 685

Clinical Practice. Each student has a designated area of pastoral responsibility, usually 40 to 50 beds. Student is assisted to develop working relationships with the treatment team and to develop a style of coverage appropriate to the area.

Each student serves once per week as on-call chaplain for overnight or weekend coverage and/or does an evening of visiting with preoperative patients. These special duties involve the student in ministry in situations of crisis or heightened anxiety.

Clinical practice requires special arrangements for non-theological students. Variable credit.

RElh 689

Comprehensive Evaluations. Each student prepares a written evaluation of himself or herself and the total program experience. This evaluation is shared with the supervisor and fellow students and examined with the student in seminar and individually. The evaluation periods assist the student to examine his or her investment in learning, goals, use of program resources, relationships, and progress toward learning goals. The supervisor prepares a detailed written evaluation of the student at the end of the program which is usually shared with the student. The comprehensive evaluations are necessary for determining satisfactory completion of the course and given credit where appropriate.

The course may not be taken more than twice for academic or field work credit. Variable credit.

Sociology

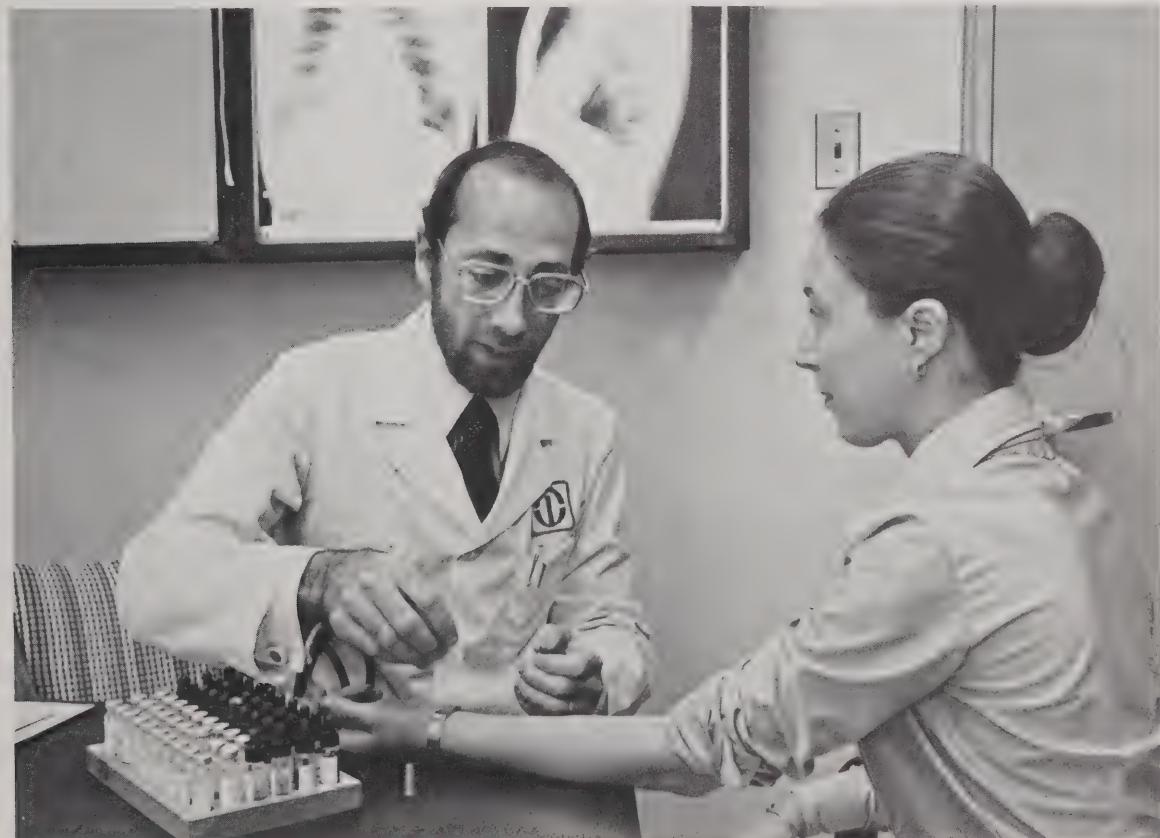
SOCIO 511

Processes of Social Change. Theories and techniques of analyzing change processes and facilitating change in professional settings. Specific experiences of work in novel settings or roles will be shared by guest speakers. Theoretical and practical issues on becoming a change agent will be covered. (4-0-4)

Statistics

STATS 301

Probability and Statistics. Basic statistical concepts and techniques including probability measures. (3-0-3)





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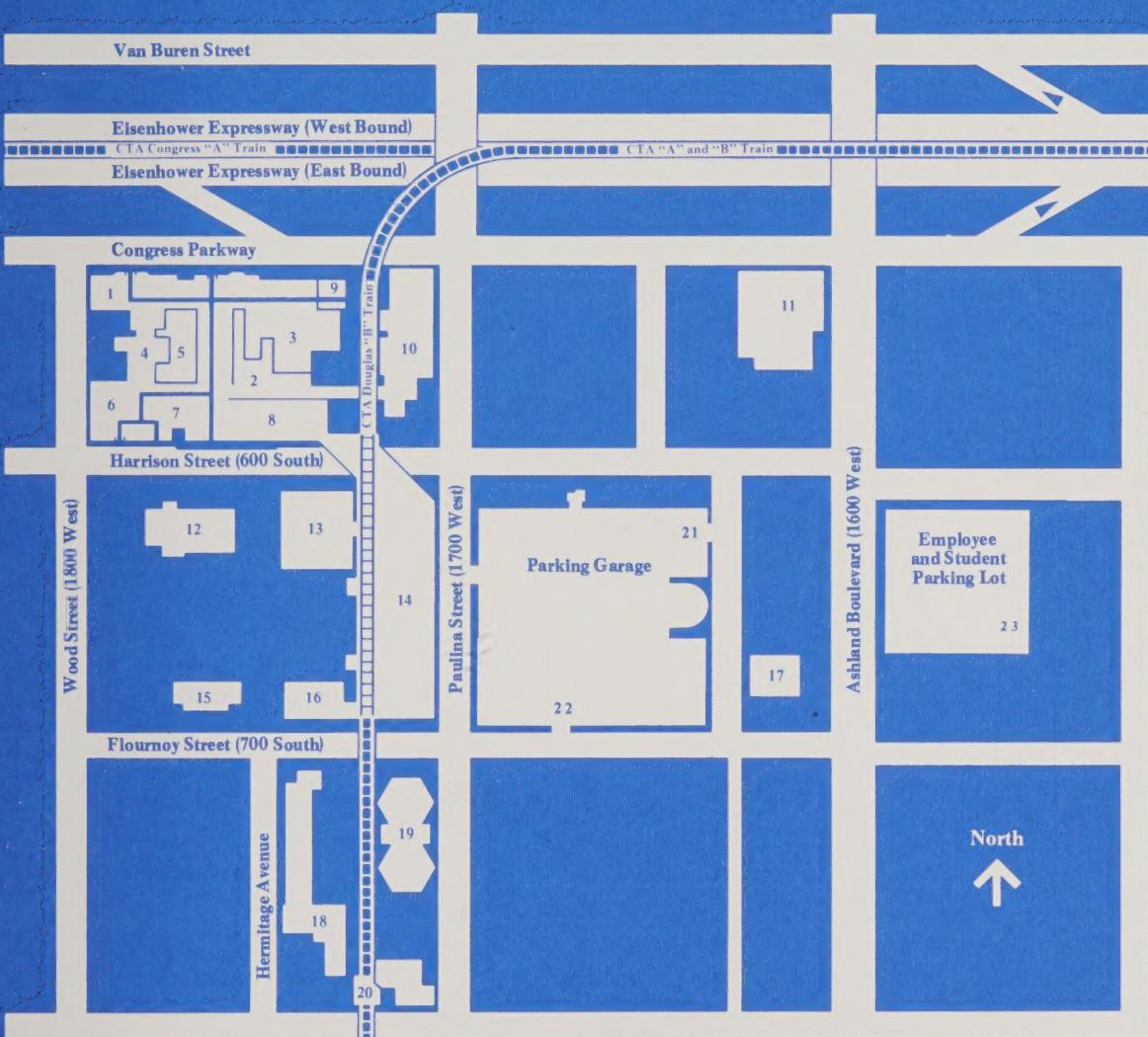
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